PB89-225494

Superfund Record of Decision (EPA Region 5) Belvidere Landfill, IL. (First Remedial Action), June 1988

(U.S.) Environmental Protection Agency, Washington, DC

29 Jun 88

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R05-88/069
June 1988

PB89-225494

EPA

Superfund Record of Decision:

Belvidere Landfill, IL

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R05-88/069	2.	3. Recipient's Accession No. PB89 225494/AS
4. Title and Subtitle SUPERFUND RECORD OF DECISION Belvidere Landfill, IL First Remedial Action			5. Report Date 6/29/88 6.
7. Author(s)			8. Performing Organization Rept. No.
9. Performing Orgainization Name and Address			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Belvidere Landfill (BL), occupying 19.3 acres of the 139-acre site, is located just outside the City of Belvidere, County of Boone, Illinois. The site is located within the 100-year flood plain of the Kishwaukee River, which is adjacent to the site. Located within the site boundaries are two ponds and a drum disposal area. The City of Belvidere owned the landfill from 1939 to 1973, operating first as a municipal landfill until 1965 and then as an industrial landfill until 1973. In late 1970, the City of Belvidere applied for a solid waste disposal permit. The application was to permit the disposal of 52 tons per day of domestic garbage, landscape wastes, partially dewatered sludge, and demolition material. However, in 1971, the operator disclosed that up to 100 tons per day of wastes were being deposited. This waste consisted of 35 tons of residential waste, 30 tons of industrial source waste, and 35 tons of commercial source waste. Approximately 790,000 yd3 of waste were disposed of at the landfill. IEPA denied the City's permit application in January 1971, and the landfill was formally closed in 1973. Between 1975 and 1982, IEPA repeatedly cited the landfill for inadequate cover violations. In the summer of 1979, sand from
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
Belvidere Landfill, IL
First Remedial Action
Contaminated Media: gw, soil
Key Contaminants: Organics (PAHs, PCBs)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

Availability Statement	19. Security Class (This Report) None	21. No. of Pages 70
	20. Security Class (This Page) None	22. Price

EPA/ROD/R05-88/069
Berrydale Landfill, IL
First Remedial Action

16. ABSTRACT (continued)

adjacent areas and prairie plant vegetation were applied as a final cover. The primary contaminants of concern affecting the soil and ground water include: organics, PCBs, PAHs, metals, and lead.

The selected remedial action for this site includes: RCRA Subtitle C capping over the 19.3-acre landfill; treatment or containment of soil from the drum disposal area following resampling to determine the magnitude of PCB contamination; ground water pump and treatment possibly using air stripping with discharge to either the Kishwaukee River or the city treatment plant; ground water monitoring; pond and river fish monitoring; installation of an upgraded fence; deed restrictions to control unacceptable onsite activities and construction; and flood control measures to prevent erosion of the cap and landfill contents. The estimated capital cost for this remedial action is $5,900,000 with annual O&M of $271,000.

PERFORMANCE STANDARDS OR GOALS: The ground water extraction and treatment system will operate until a 10-6 cumulative life-time cancer risk is met at the point of compliance. PCBs greater than 50 mg/kg will be disposed of, or incinerated, offsite. PCBs less than 50 mg/kg will be consolidated on the landfill. Quantitative goals were not specified for other contaminants.

INSTITUTIONAL CONTROLS: Access restrictions involve upgrading the existing fence to prevent recreational use of the landfill and to ensure the integrity of the cap. Deed restrictions include controlling unacceptable onsite construction and activities.

KEYWORDS: Air Stripping; ARARs; Capping; Carcinogenic Compounds; Deed Restrictions; Direct Contact; Flood Plain; Ground Water; Ground Water Monitoring; Ground Water Treatment; Inorganics; Institutional Controls; O&M; Offsite Discharge; Onsite Treatment; Organics; PAHs; PCBs; Soil; Toxic Substances Control Act; Treatability Studies.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Belvidere Municipal No. 1 Landfill
Belvidere, Illinois

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Belvidere Municipal No. 1 Landfill site developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based upon the contents of the administrative record for the Belvidere Municipal No. 1 Landfill site. The attached index identifies the items which comprise the administrative record upon which the selection of a remedial action is based.

The State of Illinois concurs on the selected remedy.

DESCRIPTION OF THE REMEDY

This final remedy addresses the source of the contamination by containing the on-site wastes and contaminated soils and extracting and treating the contaminated groundwater. The function of this remedy is to reduce the risk associated with exposure to the contaminated material and the amount of infiltration contributing to groundwater contamination, in addition to reducing the risk associated with exposure to contaminated groundwater.

The major components of the selected remedy include:

- Flood Control Measures;
- Deed restrictions;
- Installing an upgraded security fence around the landfill site;
- Monitoring to ensure the effectiveness of the remedial action;
- Capping the 19-acre landfill in accordance with Resource Conservation and Recovery Act requirements;
- Plume barrier groundwater extraction and treatment system.

DECLARATION

The selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The size of the landfill and the fact that there are no on-site hot spots that represent the major sources of contamination preclude a remedy in which contaminants effectively could be excavated and treated.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

June 29th, 1988
Date

Valdas V. Adamkus
Regional Administrator
Region V

RECORD OF DECISION SUMMARY
BELVIDERE MUNICIPAL NO. 1 LANDFILL

I. SITE DESCRIPTION

The Belvidere Municipal No. 1 Landfill site is located just outside the western city limits of Belvidere, Illinois (population 15,176) (**Figure 1**). The landfill occupies approximately 19 acres of the 139-acre site. The site is bordered by the Kishwaukee River to the west, Spencer Park to the south, by an active gravel pit to the north, and by Appleton Road (a residential neighborhood) to the east.

The southern and western edges of the site are located within the 100-year floodplain of the Kishwaukee River. Located within the site boundaries to the east of the landfill are two ponds and the drum disposal area immediately northwest of the landfill (**Figure 2**). The Boone County Conservation District uses the area as an experimental prairie and for recreational fishing - swimming is not allowed and violators of this rule are removed from the site. The ponds are abandoned gravel pits which have been filled by groundwater with additional contributions of surface water runoff from the landfill. The Kishwaukee River is also used for recreational fishing and boating.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

The Belvidere landfill was owned and operated by the City of Belvidere from 1939 to 1965 as a municipal landfill. The landfill operations disposed of waste in an old gravel pit from sand and gravel operations prior to 1939. From 1965 to 1973, the city retained ownership while private contractors operated the landfill. During this time period (1965 - 1973) industrial wastes were accepted at the landfill.

In late 1970, the City of Belvidere applied for a solid waste disposal permit. The application stated that the waste to be deposited at the landfill consisted of approximately 52 tons per day of domestic garbage, landscape wastes, partially dewatered sludge and demolition material. However in 1971 the operator disclosed that up to 100 tons of waste were being deposited daily. This waste consisted of 35 tons of residential waste, 30 tons from industrial sources and 35 tons from commercial sources. Inspection reports by IEPA personnel indicate that special wastes, some of which are currently classified by U.S. EPA as hazardous, were disposed of in the landfill from late 1970 to early 1973. IEPA denied the city's permit application on January 19, 1971 and the landfill was formally closed in 1973.

Between 1975 and 1982, IEPA repeatedly cited the landfill for inadequate cover violations. In the summer of 1979, excavations from the borrow area south and west of the landfill were applied as a final cover. The cover consisted of fine to medium grained sand and was vegetated with native

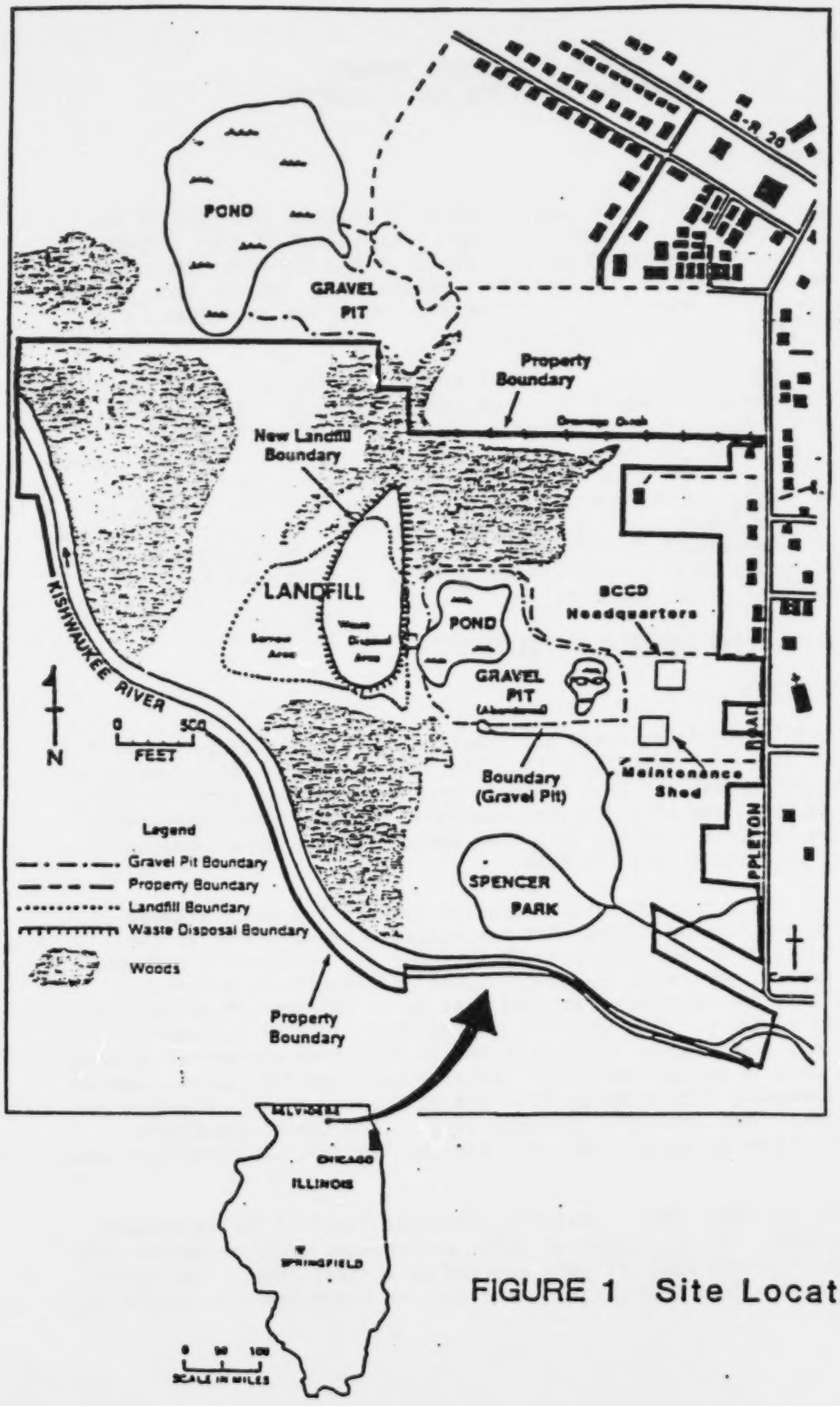


FIGURE 1 Site Location Map

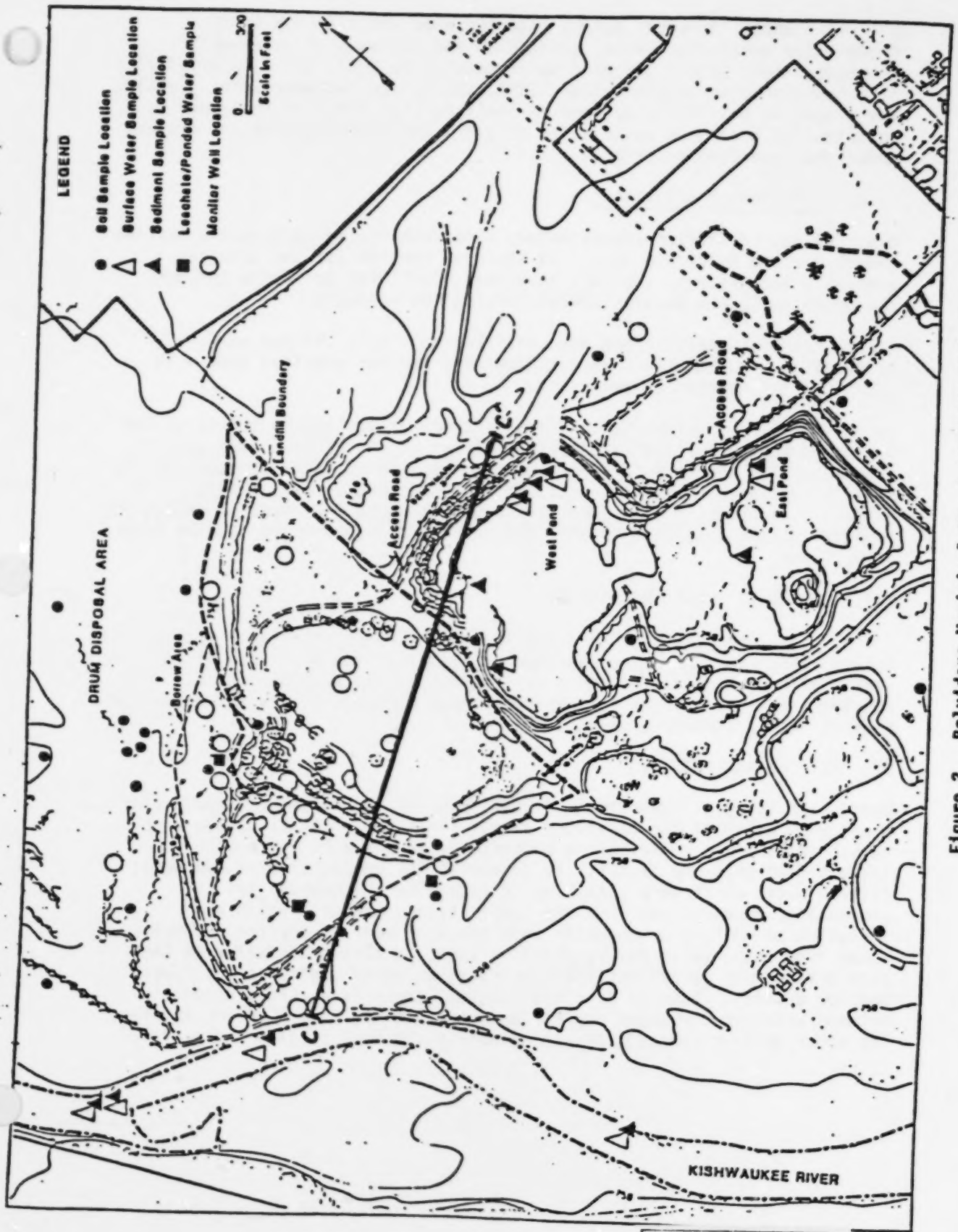


Figure 2 Belvidere Municipal No. 1 Landfill Site Map

Reproduced from
best available copy.

prairie plants. Remedial action also included installation of 10 groundwater monitoring wells, collection and analysis of groundwater, leachate, river water, and pond water samples by IEPA, and completion of a site hydrogeologic investigation (IEPA, 1981). In December 1982, the site was placed on U.S. EPA's National Priorities List (NPL) of abandoned or uncontrolled hazardous waste sites eligible for investigation and cleanup under the Superfund program.

B. Enforcement Activities

U.S. EPA has identified approximately nine potentially responsible parties (PRPs) for the Belvidere site. As business records for the site are virtually nonexistent, the PRPs have been identified primarily through responses to CERCLA Section 104(e) information requests.

A PRP Steering Committee has been established. U.S. EPA has held discussions with the PRP Steering Committee and has provided them with technical information as requested.

On May 18, 1988, Special Notice Letters pursuant to Section 122(e) of the Superfund Amendments and Reauthorization Act (SARA) of 1986 were sent to all PRPs. The deadline for receipt of a "good faith offer" to conduct the remedial design and remedial action is July 25, 1988. U.S. EPA is currently negotiating with PRPs for them to conduct the remedial design and remedial action discussed in this Record of Decision Summary and the Record of Decision.

III. COMMUNITY RELATIONS HISTORY

The U.S. EPA and IEPA published the Proposed Plan in accordance with CERCLA Section 117. This document was made available at the beginning of the five week public comment period and a public meeting was held during this time. Comments received and the responses to those comments are contained in the Responsiveness Summary (Appendix A).

IV. SITE CHARACTERISTICS

During the Remedial Investigation (RI), U.S. EPA installed 26 groundwater monitoring wells at the Belvidere site. These wells can be broken down into: three wells representing background; seven wells which were installed through the landfill to determine the composition of leachate; fifteen wells which were installed to determine the composition of groundwater downgradient from the landfill; and one well which was installed to collect groundwater from the deep bedrock aquifer. Samples taken from these wells during drilling indicate that groundwater in the site area occurs in two distinct aquifers, an upper aquifer and a lower bedrock aquifer. Despite this distinction, there is a direct connection between water in the upper aquifer and water in the lower bedrock aquifer. The upper aquifer consists of approximately 100 feet of sand and gravel,

which is referred to as the Mackinaw Member of the Henry Formation. The average groundwater flow rate for the sand and gravel aquifer was found to be 254 ft/yr. The lower bedrock aquifer is represented by the Galena Dolomite, which has an estimated groundwater flow rate of 9.38 ft/yr.

In the upper portion of the sand and gravel aquifer beneath the site, groundwater appears to flow in a southwesterly direction toward the Kishwaukee River. Groundwater flow in the deeper sand and gravel and bedrock aquifers is also to the southwest. Vertical gradients between the deep and shallow wells are very slight; water levels vary by no more than a few tenths of feet at the locations measured. These vertical gradients appear to be, at least in part, a function of the well's proximity to the river and seasonal fluctuations in the water table. This suggests that discharge from the deeper part of the sand and gravel aquifer to the river may occur during certain times of the year near the river. However, these data are too limited to say with certainty whether groundwater in the lower sand and gravel aquifer is discharging to the river or flowing beneath the river in the vicinity of the site. Monitor wells on the other side of the river would be needed to better characterize groundwater flow in the sand and gravel and bedrock aquifers adjacent to the river.

Average precipitation in the Belvidere area of 35.62 inches per year eventually reaches surface water bodies via overland runoff or the groundwater via infiltration. Runoff from the landfill occurs radially down the slopes influencing the west pond and the river, as well as low area adjacent to the landfill. Infiltration into the landfill is one of the primary sources of leachate generation and subsequent groundwater contamination at the site.

The landfill contains approximately 790,000 cubic yards of waste. It covers approximately 19.3 acres and has a maximum thickness of 39 feet. It is estimated that the bottom 10% of the landfill is perennially saturated with groundwater (**Figure 3**).

Laboratory analyses were conducted on groundwater, on-site soil, water in residential wells along Appleton Road, and surface water and sediments in the on-site ponds and Kishwaukee River. Results of the groundwater and surface water analyses are presented in Table 1. Surface soil and sediment analytical results are presented in Table 2.

V. SUMMARY OF SITE RISKS

A Public Health and Environmental Risk Assessment was conducted to assess the potential exposure to human population, the environmental fate of the contaminants and their potential exposure pathways. Of all the compounds detected at the site, eleven indicator chemicals were identified as the compounds which will best represent the overall risk to public health (**Figure 4**). Based on an evaluation of site conditions, six potential pathways were found: air, surface water, groundwater, soil contact, soil

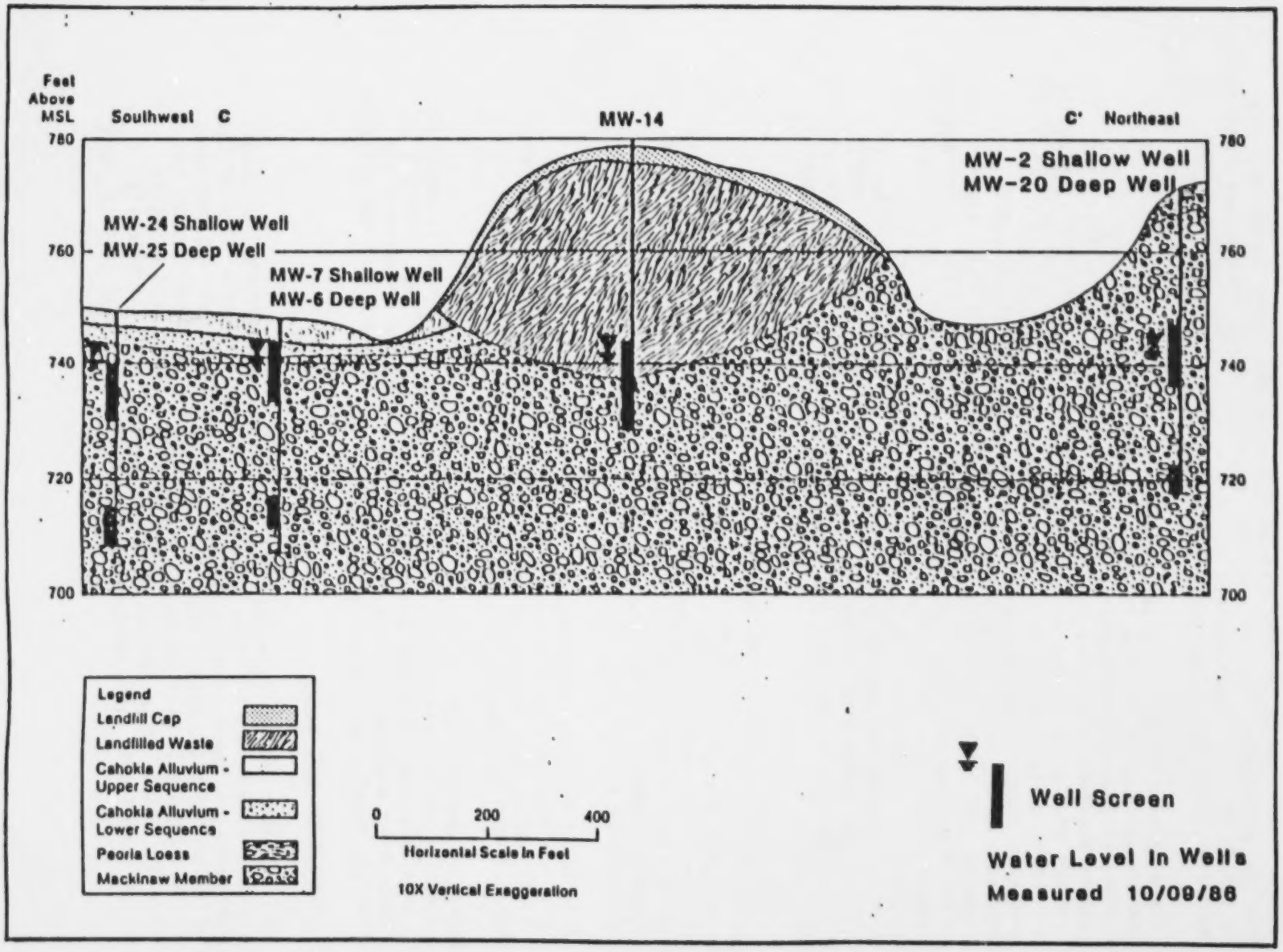


FIGURE 3 GEOLOGIC CROSS SECTION-C-C'

TABLE 1

SUMMARY OF GROUNDWATER ANALYSIS

COMPOUND	RANGE OF DETECTED Concentrations* ug/l	SDWA MCL ug/l	SDWA MCLG ug/l	WQC 10-6 RISK ug/l	CRITERIA EXCEEDED
Volatile Organics					
4-Methyl-2-Pentanone	ND-12	NE	NE	NE	
Benzene	ND-26	5	NE	0.7	Yes
Chlorobenzene	ND-1.6	NE	60(P)	NE	No
Chloroethane	ND-8.1	NE	NE	NE	
Chloroform	ND	100	NE	NE	No
Ethylbenzene	ND-32,000	NE	680(P)	NE	Yes
Toluene	ND-15,000	NE	NE	NE	
Total Xylenes	ND-96,000	NE	440(P)	NE	Yes
Trans-1,2-Dichloroethene	ND-11	NE	70(P)	NE	No
Vinyl Chloride	ND-3	2	NE	0.015	Yes
Semi-Volatile Organics					
1,3-Dichlorobenzene	ND-2	NE	NE	NE	
1,4-Dichlorobenzene	ND-7.8	75	NE	NE	No
2,4-Dimethylphenol	ND-170	NE	NE	NE	
2-Methylnaphthalene	ND-100	NE	NE	NE	
2-Methylphenol	ND-54	NE	NE	NE	
4-Chloro-3-Methylphenol	ND-6	NE	NE	NE	
4-Methylphenol	ND-120	NE	NE	NE	
Acenaphthene	ND-52	NE	NE	0.0031	Yes
Acenaphthylene	ND-200	NE	NE	0.0031	Yes
Anthracene	ND-340	NE	NE	0.0031	Yes
Benzo(a)Anthracene	ND-190	NE	NE	0.0031	Yes
Benzo(a)Pyrene	ND-140	NE	NE	0.0031	Yes
Benzo(b)Fluoranthene	ND-106	NE	NE	0.0031	Yes
Benzo(g,h,i)Perylene	ND-78	NE	NE	0.0031	Yes
Benzo(k)Fluoranthene	ND-35	NE	NE	0.0031	Yes
Benzoic Acid	ND-86	NE	NE	NE	
Benzyl Alcohol	ND-2	NE	NE	NE	
Butylbenzylphthalate	ND-70	NE	NE	NE	
Chrysene	ND-180	NE	NE	0.0031	Yes
Di-n-Butylphthalate	ND-82	NE	NE	NE	
Di-n-Octylphthalate	ND-28	NE	NE	NE	
Dibenzo(a,h)Anthracene	ND-4.7	NE	NE	NE	

TABLE 1 (Continued)

SUMMARY OF GROUNDWATER ANALYSIS

COMPOUND	RANGE OF DETECTED Concentrations* ug/l	SDWA MCL ug/l	SDWA MCLG ug/l	WQC 10-6 RISK ug/l	CRITERIA EXCEEDED
Semi-Volatile Organics (Continued)					
Dibenzofuran	ND-33	NE	NE	NE	
Diethylphthalate	ND-26	NE	NE	NE	
Fluoranthene	ND-430	NE	NE	0.0031	Yes
Fluorene	ND-260	NE	NE	0.0031	Yes
Indeno(1,2,3-cd)Pyrene	ND-62	NE	NE	0.0031	Yes
Isophorone	ND-2	NE	NE	NE	
N-Nitroso-Di-n-Propylamine	ND-10	NE	NE	NE	
N-Nitrosodiphenylamine	ND-37	NE	NE	70	No
Napthalene	ND-420	NE	NE	NE	
Nitrobenzene	ND-17	NE	NE	NE	
Phenanthrene	ND-820	NE	NE	NE	
Pyrene	ND-620	NE	NE	NE	
bis(2-Ethylhexyl)Phthatlate	ND	NE	NE	NE	
Pesticides/PCBs					
Alpha-BHC	ND-0.01	NE	NE	NE	
Aroclor-1242	ND-0.5	NE	NE	0.008	Yes
Aroclor-1254	ND-75	NE	NE	NE	
Aroclor-1260	ND-29	NE	NE	NE	
Gamma-BHC (Lindane)	ND-0.02	4	NE	NE	No
Inorganics					
Aluminum	ND-18,400	NE	NE	NE	
Antimony	ND	NE	NE	NE	
Arsenic	ND-20	50	NE	NE	No
Barium	ND-488	1000	1500	NE	No
Beryllium	ND-3	NE	NE	NE	
Cadmium	ND-3	10	5	NE	No
Calcium	59,760-164,000	NE	NE	NE	
Chromium	ND-133	50	120	NE	Yes
Cobalt	ND-27	NE	NE	NE	
Copper	ND-44	NE	1300	NE	No

TABLE 1 (Continued)

SUMMARY OF GROUNDWATER ANALYSIS

COMPOUND	RANGE OF DETECTED Concentrations* ug/l	SDWA MCL ug/l	SDWA MCLG ug/l	WQC 10-6 RISK ug/l	CRITERIA EXCEEDED
Inorganics (Continued)					
Cyanide	ND-120	NE	NE	NE	
Iron	ND-19,500	NE	NE	NE	
Lead	ND-16	50	20	NE	No
Magnesium	24,900-316,000	NE	NE	NE	
Manganese	ND-985	NE	NE	NE	
Mercury	ND-0.5	2	3	NE	No
Nickel	ND-86	NE	NE	NE	
Potassium	ND-330,000	NE	NE	NE	
Selenium	ND-8	10	45	NE	No
Silver	ND-37	50	NE	NE	No
Sodium	4,870-338,000	NE	NE	NE	
Thallium	ND	NE	NE	NE	
Vanadium	ND-33	NE	NE	NE	
Zinc	ND-81	NE	NE	NE	

* Range presented includes both downgradient and landfill groundwater monitoring wells.
(a) Safe Drinking Water Act Maximum Contaminant Level.
(b) Safe Drinking Water Act Maximum Contaminant Level Goals. (P) denotes proposed MCLG.
(c) Water Quality Criteria for protection of human health from consumption of water (for 10-6 risk).
NE - Not Established.
ND - Not Detected. Detection limits presented in Tables 5-1, 5-2 and 5-3.

TABLE 1 (Continued)

SUMMARY OF SURFACE WATER ANALYSIS

COMPOUND	RANGE OF DETECTED CONCENTRATIONS* ug/l	1/10 96-HR TLm ug/l	GENERAL USE STANDARD ug/l	AWQC (FISH CONSUMPTION) ug/l	CRITERIA EXCEEDED
Volatile Organics					
Benzene	ND-1.4	2000	NE	400	No
Bromodichloromethane	ND-5	NE	NE	NE	
Trichloroethene	ND-<5	4000	NE	NE	No
Semi-Volatile Organics	ND				
Pesticides/PCBs	ND				
Inorganics					
Aluminum	37-1270	NE	NE	45,000	N
Antimony	ND-6	NE	NE	NE	
Barium	ND-61	NE	5000	NE	No
Cadmium	ND-9.2	NE	50	NE	No
Calcium	36,000-86,280	NE	NE	NE	
Chromium	ND-307	NE	1000	3,433,000	No
Cobalt	ND-28	NE	NE	NE	
Copper	ND-19	NE	20	NE	No
Iron	ND-2040	NE	1000	NE	Yes
Lead	ND-6	NE	100	NE	No
Magnesium	33,800-43,000	NE	NE	NE	
Manganese	ND-132	NE	1000	100	Yes
Mercury	ND-0.29	NE	0.5	0.5	No
Nickel	ND-175	NE	1000	1000	No
Potassium	1,700-3,700	NE	NE	NE	
Sodium	7,500-74,000	NE	NE	NE	
Zinc	ND-57	NE	1000	NE	No

* Range presented consists of data from pond nd river water samples.
(a) One-tenth of the concentration represented by the 96-hr median Tolerance Limit, as defined in 35 IAC 302.210.
(b) Illinois General Use Standards protect the state's water for aquatic life, agricultural use, primary and secondary contact use, industrial use, and aesthetic quality, as defined in 35 IAC 302.208.
(c) U.S. EPA Ambient Water Quality Criteria for Protection of Human Health from Consumption of Contaminated Aquatic Organisms.
NE - Not Established.
ND - Not Detected. Detection limits presented in Tables 5-1, 5-2 and 5-3.

TABLE 2

SUMMARY OF SURFACE SOILS ANALYSES

CHEMICALS	BACKGROUND			DRUM DISPOSAL AREA			LANDFILL		
	Fraction Pos Respon	Median Concentration	Range	Fraction Pos Respon	Median Concentration	Range	Fraction Pos Respon	Median Concentration	Range
VOLATILE ORGANICS		(ug/kg)	(ug/kg)		(ug/kg)	(ug/kg)		(ug/kg)	(ug/kg)
1,1,1-Trichloroethane	0/1	----	<5	0	----	----	0	----	----
Chloroform	0	----	<5	2/4	20	18 - 22	0	----	----
Ethylbenzene	0	----	<5	0	----	----	1/3	14	----
Tetrachloroethene	0	----	<5	4/4	8.68	2.8 - 26	0	----	----
Total Xylenes	0	----	<5	0	----	----	1/3	150	----
SEMI-VOLATILES									
4-Nitrophenol	0/1	----	<1600	0	----	----	1/8	41	----
Benzo(a)Anthracene	0	----	<330	0	----	----	3/8	80	76 - 140
Benzo(a)Pyrene	0	----	<330	0	----	----	1/8	130	----
Benzo(b)Fluoranthene	0	----	<330	0	----	----	2/8	125	50 - 200
Benzo(g,h,i)Perylene	0	----	<330	0	----	----	1/8	110	----
Benzo(k)Fluoranthene	1/1	40	----	0	----	----	3/8	63	49 - 140
Butylbenzylphthalate	0	----	<330	3/5	210	100 - 300	1/8	39	----
Chrysene	0	----	<330	0	----	----	3/8	97	43 - 140
Di-n-Butylphthalate	1/1	61	----	0	----	----	7/8	58	44 - 480
Di-n-Octylphthalate	0	----	<330	0	----	----	1/8	44	----
Fluoranthene	1/1	44	----	0	----	----	5/8	110	35 - 300
Indeno(1,2,3-cd)Pyrene	0	----	<330	0	----	----	1/8	120	----
Pentachlorophenol	0	----	<1600	0	----	----	2/8	145	120 - 170
Phenanthrene	0	----	<330	0	----	----	2/8	135.5	81 - 190
Phenol	1/1	140	----	0	----	----	0	----	----
Pyrene	1/1	50	----	0	----	----	5/8	67	53 - 180
bis(2-Ethylhexyl)Phthala	1/1	41	----	3/5	320	74 - 3100	5/8	370	88 - 3200
PESTICIDES/PCBs									
Aroclor-1242	0	----	<80	0	----	----	1/14	100	----
Aroclor-1254	1/7	36	----	4/4	2025	730 - 51000	6/14	390	34 - 3500
Aroclor-1260	0/8	----	<160	0	----	----	2/14	144.5	9 - 280

TABLE 2 (continued)

SUMMARY OF SURFACE SOILS ANALYSES

CHEMICALS	BACKGROUND			DRUM DISPOSAL AREA			LANDFILL		
	Fraction Pos Respon	Median Concentration	Range	Fraction Pos Respon	Median Concentration	Range	Fraction Pos Respon	Median Concentration	Range
INORGANICS		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)
Aluminum	1/1	4760	----	4/4	3680	3610 - 5650	8/8	2435	1640 - 6220
Antimony	0	----	<12	1/4	0.62	----	0	----	----
Arsenic	1/1	1.6	----	4/4	2	1.5 - 3.9	8/8	1.75	1.0 - 2.8
Barium	1/1	49.4	----	4/4	89.6	57.4 - 118	7/8	173	64.3 - 1530
Beryllium	1/1	0.21	----	4/4	0.17	0.12 - 0.50	5/8	0.13	0.05 - 0.35
Cadmium	1/1	1.29	----	4/4	2.03	1.43 - 6.18	7/8	2.72	0.8 - 10.5
Calcium	1/1	2060	----	4/4	33900	11300 - 60800	8/8	53400	1640 - 80080
Chromium	1/1	6.16	----	4/4	10.82	5.09 - 30.3	8/8	8.26	3.3 - 60
Cobalt	1/1	4.17	----	4/4	2.41	1.66 - 3.54	6/8	1.99	1.55 - 7.2
Copper	1/1	4.95	----	4/4	6.43	4.05 - 24.8	7/8	10.6	3.77 - 14.2
Cyanide	0	----	<10	0	----	----	2/8	1.02	0.84 - 1.2
Iron	1/1	5830	----	4/4	28550	10300 - 63600	8/8	9085	5540 - 69700
Lead	1/1	19.1	----	4/4	56.15	16.4 - 116	8/8	45.3	2.9 - 1000
Magnesium	1/1	1080	----	4/4	8270	4740 - 19800	8/8	13095	5730 - 41920
Manganese	1/1	6.46	----	4/4	422.5	273 - 623	8/8	412.5	146 - 3300
Mercury	0	----	<0.2	0	----	----	1/8	0.3	----
Nickel	1/1	5.45	----	4/4	5.61	3.52 - 15.2	8/8	10.75	3.15 - 18.8
Potassium	1/1	420	----	4/4	295	270 - 370	8/8	354	116 - 840
Selenium	0	----	<1	0	----	----	1/8	0.4	----
Silver	1/1	2.01	----	4/4	4.35	2.27 - 14.1	3/8	2.3	1.98 - 5.5
Sodium	1/1	20.2	----	4/4	59.55	46.5 - 72.4	5/8	129	56.6 - 237
Thallium	1/1	0.19	----	4/4	0.19	0.02 - 0.34	3/8	0.19	0.19 - 0.19
Vanadium	1/1	10.3	----	4/4	8.81	7.09 - 12.6	8/8	9.7	5.71 - 13.8
Zinc	1/1	33.3	----	4/4	171.5	38.6 - 565	8/8	172	14.6 - 2160

TABLE 2 (continued)

SUMMARY OF SEDIMENT ANALYSES

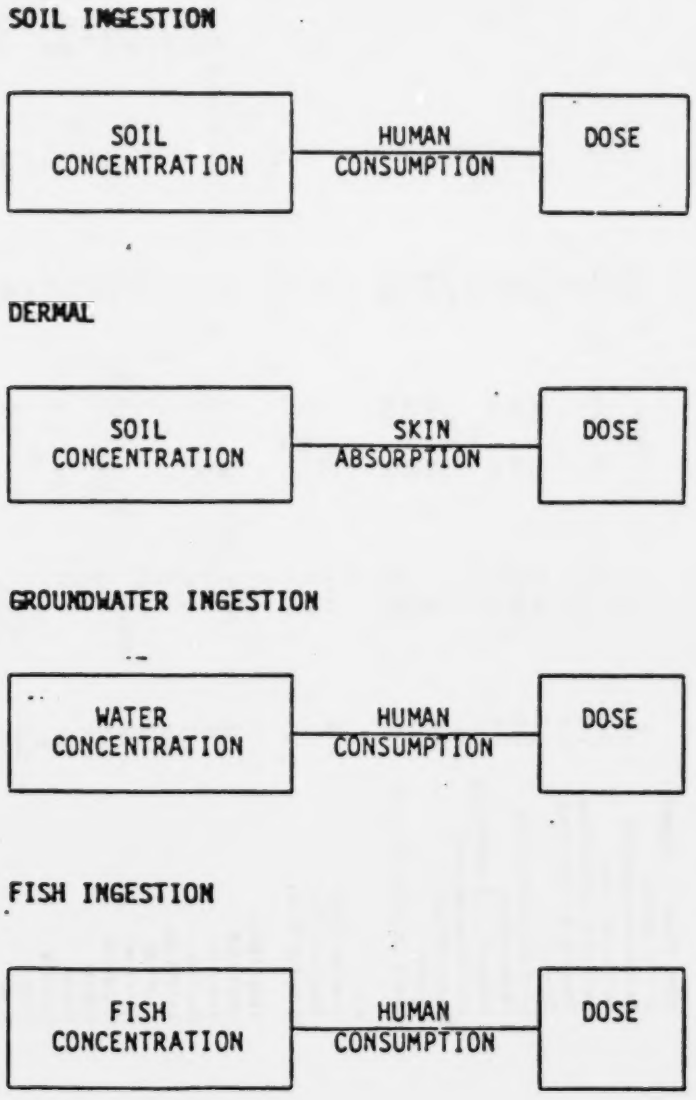
CHEMICAL	RIVER UPSTREAM			RIVER DOWNSTREAM			PONDS		
	Fraction Pos Respon	Median Conc (ug/kg)	Range	Fraction Pos Respon	Median Conc (ug/kg)	Range	Fraction Pos Respon	Median Conc (ug/kg)	Range
VOLATILE ORGANICS*									
SEMI-VOLATILE ORGANICS									
4-Nitrophenol	0	----	<1600	2/4	138.5	87 - 190	4/8	82	66 - 120
Benzo(a)Anthracene	1/2	64	----	1/4	67	----	1/8	94	----
Benzo(a)Pyrene	2/2	85.5	61 - 110	1/4	64	----	1/8	96	----
Benzo(b)Fluoranthene	1/2	100	----	0	----	----	1/8	34	----
Benzo(g,h,i)Perylene	1/2	98	----	1/4	160	----	0	----	----
Chrysene	2/2	80.5	61 - 100	2/4	114.5	79 - 150	1/8	94	----
Di-n-Butylphthalate	2/2	149.5	79 - 220	2/4	48	45 - 51	6/8	54.5	31 - 120
Fluoranthene	2/2	129.5	99 - 160	2/4	335	170 - 500	2/8	97	24 - 170
Indeno(1,2,3-cd)Pyrene	0	----	<330	1/4	160	----	0	----	----
Pentachlorophenol	0	----	<1600	3/4	46	42 - 880	2/8	101.5	33 - 170
Phenanthrene	2/2	87	64 - 110	2/4	230	110 - 350	1/8	100	----
Pyrene	2/2	123	96 - 150	2/4	220	140 - 300	2/8	86	22 - 150
bis(2-Ethylhexyl)Phtha	2/2	483.5	67 - 900	2/4	1110	120 - 2100	6/8	93	39 - 350
PCBs									
Aroclor-1242	0/8	----	<80	0	----	----	3/8	44	32 - 110
Aroclor-1254	0	----	<160	0	----	----	3/8	56.5	24 - 140
Aroclor-1260	0	----	<160	1/3	65	----	0	----	----
INORGANICS									
Aluminum	2/2	1054.5 mg/k	780 - 132	4/4	1477.5 mg/k	1030 - 4850	8/8	1145 mg/k	868 - 1652
Arsenic	2/2	1.08	0.66 - 1.5	4/4	2.4	0.52 - 3.2	8/8	0.79	0.44 - 1.4
Barium	1/2	6.52	----	4/4	18	10.8 - 56.6	6/8	7	4.08 - 11.5
Beryllium	1/2	0.17	----	2/4	0.12	0.11 - 0.17	6/8	0.13	0.10 - 0.15
Cadmium	1/2	0.63	----	3/4	0.71	0.71 - 4	7/8	0.40	0.34 - 1.7
Calcium	2/2	100660	77420 - 123920	4/4	63996	30600 - 127270	8/8	70150	1545 - 107300
Chromium	2/2	5.49	327 - 7.7	3/4	3.54	2.8 - 19	8/8	4.16	2.52 - 8.0
Cobalt	1/2	0.6	----	2/4	0.75	0.74 - 0.76	4/8	0.71	0.62 - 0.79
Copper	2/2	2.81	0.91 - 4.7	3/4	5.1	3.19 - 16.3	8/8	3.71	0.57 - 8
Cyanide	0	----	<10	0	----	----	1/8	1.20	----
Iron	2/2	3836	3492 - 418	4/4	5200	4220 - 15296	8/8	3005	2430 - 4345
Lead	2/2	211.7	18.4 - 405	4/4	13.3	2.2 - 21.8	8/8	15.95	4 - 24.7
Magnesium	2/2	47940	42900 - 529	4/4	28450	12400 - 51660	8/8	31400	18700 - 73830
Manganese	2/2	266	171 - 361	4/4	170.5	119 - 1940	8/8	88.65	71 - 145
Nickel	2/2	6.19	1.98 - 10.4	4/4	6.54	1.98 - 20.3	8/8	2.3	1.77 - 11
Potassium	2/2	116.5	113 - 120	4/4	163.5	140 - 299	8/8	150	94 - 190
Silver	0	----	<2	0	----	----	2/8	0.51	0.46 - 0.56
Sodium	1/2	108	----	2/4	85.5	62 - 109	6/8	80.95	68 - 115
Vanadium	2/2	6.79	6.3 - 7.28	3/4	4.43	3.99 - 12.3	8/8	4.19	3.19 - 8.7
Zinc	2/2	13.7	12.9 - 14.5	4/4	11.67	1.17 - 61.2	8/8	11.22	8.24 - 26.7

* No volatile organic compounds were detected in any of the 3 sample areas.

FIGURE 4 INDICATOR CHEMICALS

Organic	Inorganic
Dimethylphenol	Cadmium
bis(2-ethylhexyl)phthalate	Iron
PAH (noncarcinogenic compounds)	Lead
PAH (carcinogenic compounds)	Silver
PCBs	
Xylene	
Chloroform	

FIGURE 5 POTENTIAL EXPOSURE PATHWAYS



ingestion, and fish consumption. Of the six exposure pathways, air and surface water are not considered current exposure pathways. The remaining five pathways (Figure 5) groundwater, soil contact, soil ingestion and fish consumption -- create varying levels of noncarcinogenic (Table 3) and carcinogenic (Table 4) risk, depending on usage and magnitude of contamination.

The risks associated with exposure to contaminants were determined using mathematical models. The models calculated an exposure dose in mg/kg/day for both children and adults based on an assumed frequency of exposure to indicator chemicals. The average and maximum exposures were based upon average and maximum contaminant concentrations at points where receptor contact could occur. Also, the average and maximum exposure dosages were used to evaluate average (most probable) and maximum (worst plausible) noncarcinogenic hazards and carcinogenic risk levels.

Surface Water

There is a potential for transport of contaminants to the Kishwaukee River and ponds in Spencer Park adjacent to the landfill as a result of erosion and surface runoff. Surface water and sediment samples that were collected from the river and ponds as part of the Remedial Investigation indicate that surface water contamination may have occurred. However, these surface water bodies do not exceed the Illinois Water Pollution Control "General Use" water quality standards (Section 301). The general use standards provide for protection of aquatic life, agricultural use, primary and secondary contact, and most industrial uses. There is no evidence that the Kishwaukee River in the vicinity of Belvidere is used as a potable water supply. Consequently, human exposure due to consumption of drinking water from the Kishwaukee River (or the ponds) does not represent a pathway of concern. Because of the low contaminant levels found for the river, exposure due to primary (swimming) and secondary (boating) contact is expected to be negligible. No swimming activity has been reported in the ponds and will not be considered further.

Air

Air is not considered a major pathway for possible contact with site contaminants. Vaporization of the volatile contaminants from soil or surface waters would not be expected to result in hazardous ambient air concentrations even on a chronic basis. The probability of inhaling contaminated dusts is also considered minimal. The area is well vegetated, lessening the likelihood of dust generation. If construction were undertaken sometime in the future where vegetation was removed and the soil exposed, an exposure hazard might exist temporarily.

Surface Soils

Direct soil contact is a potential exposure pathway for persons entering the drum disposal area and the landfill area. Small children could

Table 3

Estimated Contaminant Dosages and Noncarcinogenic Hazard Indexes (Including only Downgradient Wells)

Indicator Chemical	Soil Ingestion – Landfill Average (mg/kg/day)	Soil Ingestion – Landfill Max (mg/kg/day)	Dermal Absorption – Landfill Average (mg/kg/day)	Dermal Absorption – Landfill Max (mg/kg/day)	Groundwater Consumption – Downgradient Wells Average (mg/kg/day)	Groundwater Consumption – Downgradient Wells Max (mg/kg/day)	Total Intake – All Pathways Average (mg/kg/day)	Total Intake – All Pathways Max (mg/kg/day)	AICs (mg/kg/day)	Hazard Index Average	Hazard Index Max
					Children						
Cadmium	4.6E-07	1.8E-06	2.9E-06	1.1E-05	8.1E-06	1.0E-05	1.14E-05	2.29E-05	2.9E-04	3.9E-02	7.9E-02
Chloroform	0	0	0	0	0	0	0	0	1.0E-02	0	0
Dimethylphenol	0	0	0	0	1.8E-04	5.7E-04	1.82E-04	5.74E-04	5.7E-04	3.2E-01	1.0E+00
Iron	1.5E-03	1.2E-02	9.5E-03	7.3E-02	4.8E-03	6.6E-02	1.58E-02	1.51E-01	1.4E-02 (1)	1.1E+00 *	1.1E+01 *
Lead	7.6E-06	1.7E-04	4.7E-05	1.0E-03	4.1E-05	4.1E-05	9.56E-05	1.26E-03	1.4E-03	6.8E-02	9.0E-01
PAH (Noncar + Car)	3.0E-08	6.6E-08	1.9E-07	4.1E-07	0	0	2.20E-07	4.75E-07	5.4E-03 (2)	4.1E-05	8.8E-05
PCBs	5.1E-08	5.9E-07	3.2E-07	3.7E-06	2.0E-06	1.3E-05	2.35E-06	1.74E-05	1.6E-04 (3)	1.5E-02	1.1E-01
Phthalates/DEHP	4.7E-08	5.4E-07	2.9E-07	3.4E-06	1.8E-05	2.8E-04	1.82E-05	2.81E-04	2.0E-02	9.1E-04	1.4E-02
Silver	3.9E-07	9.3E-07	2.4E-06	5.8E-06	1.2E-04	1.2E-04	1.28E-04	1.32E-04	3.0E-03	4.3E-02	4.4E-02
Xylenes	1.4E-08	2.5E-08	8.6E-08	1.6E-07	4.2E-03	1.4E-01	4.19E-03	1.35E-01	2.0E+00	2.1E-03	6.8E-02
					Adults						
Cadmium	1.4E-07	5.3E-07	1.9E-06	7.2E-06	9.8E-06	1.2E-05	1.18E-05	1.99E-05	2.9E-04	4.1E-02	6.9E-02
Chloroform	0	0	0	0	0	0	0	0	1.0E-02	0	0
Dimethylphenol	0	0	0	0	2.2E-04	6.9E-04	2.19E-04	6.92E-04	5.7E-04	3.8E-01	1.2E+00 *
Iron	4.6E-04	3.5E-03	6.2E-03	4.8E-02	5.7E-03	7.9E-02	1.24E-02	1.31E-01	1.4E-02 (1)	8.7E-01	9.1E+00 *
Lead	2.3E-06	5.1E-05	3.1E-05	6.8E-04	4.9E-05	4.9E-05	8.21E-05	7.83E-04	1.4E-03	5.9E-02	5.6E-01
PAH (Noncar + Car)	9.2E-09	2.0E-08	1.2E-07	2.7E-07	0	0	1.32E-07	2.86E-07	5.4E-03 (2)	2.5E-05	5.3E-05
PCBs	1.5E-08	1.8E-07	2.1E-07	2.4E-06	2.4E-06	1.6E-05	2.62E-06	1.84E-05	1.6E-04 (3)	1.6E-02	1.2E-01
Phthalates/DEHP	1.4E-08	1.6E-07	1.9E-07	2.2E-06	2.2E-05	3.3E-04	2.18E-05	3.36E-04	2.0E-02	1.1E-03	1.7E-02
Silver	1.2E-07	2.8E-07	1.6E-06	3.8E-06	1.5E-04	1.5E-04	1.52E-04	1.55E-04	3.0E-03	5.1E-02	5.2E-02
Xylenes	4.2E-09	7.6E-09	5.6E-08	1.0E-07	5.0E-03	1.6E-01	5.05E-03	1.63E-01	2.0E+00	2.5E-03	8.1E-02
									Total	1.4E+00 *	1.1E+01 *

* Hazard index value exceeds 1 and may indicate an adverse health effect.

(1) This AIC for iron is derived and represents 1/10th of the the estimated safe and adequate daily dietary intake (ESADDI) for iron (reported in Goodman & Gilman, 7th Ed., 1985).

(2) Derived from the ambient water quality criterion of 188 ug/L for fluoranthene.

(3) Based on EPA Health Advisory.

Table 3 (continued)

Estimated Contaminant Dosages and Noncarcinogenic Hazard Indexes (including only Landfill Wells)

Indicator Chemical	Soil Ingestion - Landfill Average (mg/kg/day)	Soil Ingestion - Landfill Max (mg/kg/day)	Dermal Absorption - Landfill Average (mg/kg/day)	Dermal Absorption - Landfill Max (mg/kg/day)	Groundwater Consumption - Landfill Wells Average (mg/kg/day)	Groundwater Consumption - Landfill Wells Max (mg/kg/day)	Total Intake - All Pathways Average (mg/kg/day)	Total Intake - All Pathways Max (mg/kg/day)	AICs (mg/kg/day)	Hazard Index Average	Hazard Index Max
					Children						
Cadmium	4.6E-07	1.8E-06	2.9E-06	1.1E-05	2.7E-06	2.7E-06	6.0E-06	1.5E-05	2.9E-04	2.1E-02	5.3E-02
Chloroform	0	0	0	0	0	0	0	0	1.0E-02	0	0
Dimethylphenol	0	0	0	0	1.3E-04	4.1E-04	1.3E-04	4.1E-04	5.7E-04	2.3E-01	7.1E-01
Iron	1.5E-03	1.2E-02	9.5E-03	7.3E-02	5.3E-03	3.2E-02	1.6E-02	1.2E-01	1.4E-02 (1)	1.1E+00 *	8.2E+00 *
Lead	7.6E-06	1.7E-04	4.7E-05	1.0E-03	2.7E-05	5.4E-05	8.2E-05	1.3E-03	1.4E-03	5.9E-02	9.1E-01
PAH (Noncar + Car)	3.0E-08	6.6E-08	1.9E-07	4.1E-07	2.4E-04	3.4E-03	2.4E-04	3.4E-03	5.4E-03 (2)	4.5E-02	6.4E-01
PCBs	5.1E-08	5.9E-07	3.2E-07	3.7E-06	1.7E-05	2.5E-04	1.8E-05	2.6E-04	1.6E-04 (3)	1.1E-01	1.6E+00 *
Phthalates/DEHP	4.7E-08	5.4E-07	2.9E-07	3.4E-06	8.1E-05	1.3E-04	8.1E-05	1.4E-04	2.0E-02	4.1E-03	6.8E-03
Silver	3.9E-07	9.3E-07	2.4E-06	5.8E-06	0	0	2.8E-06	6.7E-06	3.0E-03	9.3E-04	2.2E-03
Xylenes	1.4E-08	2.5E-08	8.6E-08	1.6E-07	5.7E-03	3.2E-01	5.7E-03	3.2E-01	2.0E+00	2.9E-03	1.6E-01
									Total	1.6E+00 *	1.2E+01 *
					Adults						
Cadmium	1.4E-07	5.3E-07	1.9E-06	7.2E-06	3.3E-06	3.3E-06	5.3E-06	1.1E-05	2.9E-04	1.8E-02	3.8E-02
Chloroform	0	0	0	0	0	0	0	0	1.0E-02	0	0
Dimethylphenol	0	0	0	0	1.6E-04	4.9E-04	1.6E-04	4.9E-04	5.7E-04	2.7E-01	8.6E-01
Iron	4.6E-04	3.5E-03	6.2E-03	4.8E-02	6.4E-03	3.9E-02	1.3E-02	9.0E-02	1.4E-02 (1)	9.1E-01	6.3E+00 *
Lead	2.3E-06	5.1E-05	3.1E-05	6.8E-04	3.3E-05	6.5E-05	6.6E-05	8.0E-04	1.4E-03	4.7E-02	5.7E-01
PAH (Noncar + Car)	9.2E-09	2.0E-08	1.2E-07	2.7E-07	2.9E-04	4.1E-03	2.9E-04	4.1E-03	5.4E-03 (2)	5.4E-02	7.7E-01
PCBs	1.5E-08	1.8E-07	2.1E-07	2.4E-06	2.1E-05	3.1E-04	2.1E-05	3.1E-04	1.6E-04 (3)	1.3E-01	1.9E+00 *
Phthalates/DEHP	1.4E-08	1.6E-07	1.9E-07	2.2E-06	9.8E-05	1.6E-04	9.8E-05	1.6E-04	2.0E-02	4.9E-03	8.1E-03
Silver	1.2E-07	2.8E-07	1.6E-06	3.8E-06	0	0	1.7E-06	4.0E-06	3.0E-03	5.6E-04	1.3E-03
Xylenes	4.2E-09	7.6E-09	5.6E-08	1.0E-07	6.9E-03	3.9E-01	6.9E-03	3.9E-01	2.0E+00	3.5E-03	2.0E-01
									Total	1.4E+00 *	1.1E+01 *

* Hazard Index value exceeds 1 and may indicate an adverse health effect.

(1) This AIC for iron is derived and represents 1/10th of the the estimated safe and adequate daily dietary intake (ESADDI) for iron (reported in Goodman & Gilman, 7th Ed., 1985).

(2) Derived from the ambient water quality criterion of 188 ug/L for fluoranthene.

(3) Based on EPA Health Advisory.

Table 4

Estimated Lifetime Cancer Risks

Indicator Chemical	Soil Ingestion – Landfill – Average	Soil Ingestion – Landfill – Max	Dermal Absorption – Landfill – Average	Dermal Absorption – Landfill – Max	Groundwater Consumption – Landfill Wells – Average	Groundwater Consumption – Landfill Wells – Max	Total Intake – All Pathways – Average	Total Intake – All Pathways – Max	q1*
(including only Landfill Wells)									
Chloroform	0	0	0	0	0	0	0	0	8.10E-02
PAH (Carcinogenic)	5.5E-08	1.2E-07	7.4E-07	1.6E-06 *	1.2E-03 *	8.9E-03 *	1.2E-03 *	8.9E-03 *	1.15E+01
PCBs	1.2E-07	1.4E-06 *	1.6E-06 *	1.8E-05 *	1.6E-04 *	2.4E-03 *	1.6E-04 *	2.4E-03 *	7.00E+00
Phthalates/DEHP	9.6E-12	1.1E-10	1.3E-10	1.5E-09	6.7E-08	1.1E-07	6.7E-08	1.1E-07	6.84E-04
						Totals	1.4E-03 *	1.1E-02 *	
(including only Downgradient Wells)									
Chloroform	0	0	0	0	0	0	0	0	8.10E-02
PAH (Carcinogenic)	5.5E-08	1.2E-07	7.4E-07	1.6E-06 *	0	0	7.9E-07	1.7E-06 *	1.15E+01
PCBs	1.2E-07	1.4E-06 *	1.6E-06 *	1.8E-05 *	1.8E-05 *	1.2E-04 *	2.0E-05 *	1.4E-04 *	7.00E+00
Phthalates/DEHP	9.6E-12	1.1E-10	1.3E-10	1.5E-09	1.5E-08	2.3E-07	1.5E-08	2.3E-07	6.84E-04
						Totals	2.1E-05 *	1.4E-04 *	
(excluding groundwater pathway)									
Chloroform	0	0	0	0			0	0	8.10E-02
PAH (Carcinogenic)	5.5E-08	1.2E-07	7.4E-07	1.6E-06 *			7.9E-07	1.7E-06 *	1.15E+01
PCBs	1.2E-07	1.4E-06 *	1.6E-06 *	1.8E-05 *			1.7E-06 *	2.0E-05 *	7.00E+00
Phthalates/DEHP	9.6E-12	1.1E-10	1.3E-10	1.5E-09			1.4E-10	1.6E-09	6.84E-04
						Totals	2.5E-06 *	2.1E-05 *	

* Values represent the upper bound estimate of an individual's risk (i.e., likelihood or probability) of developing cancer as a result of exposure to site contaminant(s) over a 70-year lifespan, above and beyond naturally occurring background levels. The actual risk may be less. The "Total" values represent the excess lifetime cancer risk associated with the site as a whole. These values are influenced by the assumed exposure conditions, frequencies, and durations.

** Values exceed the 1 in 1,000,000 risk guidance risk level.

potentially be exposed to contaminants through soil ingestion. Both small and older children might also absorb contaminants through repeated dermal contact with contaminated soils while playing.

The two soil exposure pathways, soil ingestion and dermal absorption from soil contact, were also analyzed for noncarcinogenic and carcinogenic risks. Risk calculations are limited to the indicator chemicals and assume a soil ingestion rate of 0.05 g/day for children and 0.025 g/day for adults, a soil contact area for dermal absorption of arm, hand and leg, and an exposure frequency for each pathway of 52 days per year.

For noncarcinogenic risks, only iron produced a hazard index above 1.0. It occurred for the dermal absorption pathway under maximum iron concentrations. It did not occur under average iron concentrations for this pathway. For the other pathway, soil ingestion, none of the indicator parameters produced any noncarcinogenic risks.

For carcinogenic compounds, the calculations show PCBs and PAHs (carcinogenic) create a cancer risk above 1×10^{-6} for the dermal absorption pathway, when the maximum concentrations of these compounds are used. An excess cancer risk from soil absorption also exists when using the average PCB levels in the soils near the landfill. For the soil ingestion pathway, an excess cancer risk occurs with PCBs at the maximum concentration level in the soils.

Groundwater

Use of the upper aquifer downgradient of the site is not well defined. However, it is a Class II aquifer, that potentially could be a future source of potable water. A risk analysis of contaminated groundwater was based on using groundwater from the landfill monitoring wells and downgradient monitoring wells.

Potential health risks from contaminated groundwater consist of noncarcinogenic and carcinogenic risks. For the former, a hazard index is calculated based on expected dose and qualities of the parameter. A hazard index above 1.0 indicates a potential risk. Carcinogenic risks are limited to those parameters that may cause cancer. Cancer risks are expressed as the probability of excess cancer for an individual over the course of a 70-year lifetime. A guidance level of 1 in 1 million probability is used to delineate insignificant from potentially significant cancer risks. For groundwater risk, the calculations assume consumption of 1 liter per day for children and 2 liters per day for adults, with consumption occurring 52 days/year.

For noncarcinogenic risks in groundwater, the parameter iron produced a hazard index of greater than 1 in both the downgradient wells and landfill wells, when using the maximum concentration of this parameter in their respective wells. In addition, maximum PCB levels in the landfill wells produced a hazard index above 1.0. Average levels of these parameters, however, produced hazard indexes below 1.0.

For carcinogenic risks in groundwater, the parameters PCBs and PAH (carcinogenic) produced excess cancer risks above 1 in 1 million in landfill wells for both average and maximum concentrations. In downgradient wells, PCBs continued to produce excess cancer risk at average and maximum concentrations, but PAH (carcinogenic) did not. In addition, benzene and vinyl chloride, suspected carcinogens, were found in the landfill and downgradient wells, respectively, above their maximum contaminant level (MCL) for safe drinking water.

Fish

No estimates of actual fish consumption from the Kishwaukee River or the Spencer Park ponds are available, but it is assumed to be limited to a small number of local residents. Sediments in these water bodies contain PCBs, semi-volatiles and metals, while water column data from the West Pond shows slightly elevated iron levels. PCB levels in fish from these waters were below specified detection limits, although detection limits were about 20 times higher than normal due to the high lipid content in the samples. Accordingly, a final evaluation of risk from consumption of fish from these waters is not made.

VI. DESCRIPTION OF ALTERNATIVES

Nine alternatives were developed to meet the following remedial action goals:

- Minimize risk to public health and environment from direct contact with contaminated material.
- Control the migration of contaminated material to surface waters.
- Control migration of leachate to groundwater via infiltration.
- Minimize potential risk to public health from future consumption of contaminated groundwater.

Alternatives 1 and 2 eliminate the need for long-term management or monitoring; Alternatives 3, 4 and 5 employ treatment to reduce toxicity, mobility or volume of hazardous substances; Alternatives 6, 7 and 8 contain the wastes; and, Alternative 9 is the No Action Alternative. Alternatives 1, 2 and 4 are also intended to restore the groundwater within five years to a level meeting the 10^{-6} lifetime excess cancer risk.

All of the alternatives, except no action, include deed restrictions, upgrade site fencing, flood control measures, and groundwater monitoring. The nine remedial alternatives under consideration for this remedial action are described below:

Alternative 1: Excavation, On-Site Incineration and Groundwater Extraction, On-Site Treatment

Alternative 1 provides for destruction of all landfill contents and surface soils through an incinerator constructed on-site. The work includes

excavation of wastes, construction of a 500 ton/day incinerator and associated waste handling facilities, operation of the incinerator for a period of up to five years, and disposal of residual ash in an off-site RCRA landfill.

The groundwater would be extracted by two sets of barrier wells: the first set located near the Kishwaukee River to prevent contamination of the river by the migrating plume, and the second set located along the downgradient border of the landfill to trap highly contaminated groundwater. The total extracted flow is estimated to be 200 gallons per minute (gpm), and would be treated, with final disposal of the effluent to the Kishwaukee River.

Time to complete this remediation is estimated at six years; five years for incineration with an additional year of groundwater extraction and treatment after all contaminated material has been excavated and incinerated.

Total Cost of Alternative 1: $127,550,000 (in net present worth)

Alternative 2: Excavation, Off-Site Disposal and Groundwater Extraction and On-Site Treatment

Alternative 2 provides excavation of landfill contents and disposal at off-site RCRA landfills that are in compliance with the U.S. EPA CERCLA Off-site Policy. The surface soils will be removed off-site for destruction in an incinerator or disposed of in an off-site RCRA landfill. In addition to compliance with the Off-site Policy, these facilities will need to have authority under Toxic Substance Control Act (TSCA) for disposal of PCBs and disposal of some wastes may be prohibited by RCRA land disposal regulations.

Groundwater extraction and treatment would be similar to that in Alternative 1. In addition, instead of treatment and discharge to the Kishwaukee River, the groundwater could be pretreated and sent to the Belvidere Wastewater Treatment Plant.

Time to complete this remediation is estimated at six years, with five years for excavation and disposal with an additional year of groundwater extraction and treatment after all contaminated material has been removed.

Total Cost of Alternative 2: $173,280,000 (in net present worth)

Alternative 3: Sanitary Landfill-Type Cap, Soil Remediation, Plume Barrier Groundwater Extraction and On-Site Treatment

The primary intent of this alternative is to provide a source-control remedy. A sanitary landfill, multilayer cap will be constructed over the nearly 20 acre landfill site. The surface soils will be treated according to the following scenario: The soils in the drum disposal area will be resampled to confirm existing data on PCB concentrations.

- o If the soil samples indicate PCB contamination greater than 50 parts per million (ppm):
  - That soil would be taken to an off-site incinerator, thus ensuring permanent reduction of contaminant toxicity, mobility and volume or;
  - The soil would be left in place and capped with a soil cover.
- o If the soil samples indicate PCB contamination less than 50 ppm, then soils can be consolidated with the landfill material prior to capping.

For groundwater remediation, Alternative 3 proposes to extract contaminated groundwater by a plume barrier system located downgradient of the landfill. The plume barrier system is designed to intercept contaminated groundwater before it reaches the river. Total flow is expected to be 100 gpm. Extracted groundwater would be treated on-site with final disposal of the effluent to the Kishwaukee River, or alternatively, on-site pretreatment with disposal to the City of Belvidere Treatment Plant for subsequent treatment.

Groundwater extraction will reduce the movement of contamination beyond the landfill boundaries. However, groundwater will continue to pass through the landfill, picking up contaminants for an indeterminant period of time. Therefore, groundwater monitoring to determine the long-term effectiveness of the remedy will continue in perpetuity. However, treatment may be discontinued if cumulative groundwater contamination levels of indicator chemicals do not exceed 10^{-6} life-time cancer risk at the point of compliance.

Total Cost of Alternative 3: $5,617,000 (in net present worth)

Alternative 4: RCRA-Type Cap, Soil Remediation, Groundwater Lowering, Extraction and On-Site Treatment

The primary intent of this alternative is to provide a source-control remedy. A RCRA-type, multilayer cap will be constructed over the nearly 20 acre landfill site to eliminate direct contact and infiltration. To achieve compliance with ARARs, the surface soils will be treated according to the scenario previously described under Alternative 3.

For groundwater remediation, Alternative 4 proposes to lower the groundwater table to below the level of the buried wastes. Thirteen extraction wells, sized at 150 gpm, would be placed within the border of the fill and be located 25 to 40 feet into the groundwater aquifer. The lowering of the groundwater table in combination with the RCRA cap, will cut off the two sources of groundwater contamination. Extracted groundwater will be treated on-site with final disposal to the Kishwaukee River.

Groundwater under and near the landfill is estimated to approach background levels within one year after installation of the RCRA cap and start-up of the groundwater extraction and treatment system. Following remediation, the treatment plant can be abandoned, but the groundwater lowering wells will operate in perpetuity to effectively prevent recontamination of the groundwater. Therefore, long-term management of this site has not been eliminated. Groundwater extracted after remediation will be of background quality and can be discharged directly to the river without treatment.

Total Cost of Alternative 4: $22,860,000 (in net present worth)

Alternative 5: RCRA-Type Cap, Soil Remediation, Slurry Wall Groundwater Extraction and Treatment

For remediation of landfill contents and surface soils, Alternative 5 is the same as Alternative 4.

The two alternatives differ in the means for controlling the spread of contaminated groundwater. Alternative 5 proposes to place a slurry wall around the perimeter of the landfill, a distance of about 4,500 feet, in order to control the migration of contaminated groundwater. The slurry wall would extend downward 125 feet to be anchored into bedrock. Since the bedrock is hydraulically connected to the upper aquifer, some groundwater will pass under the wall. Extraction wells will be located within the perimeter of the wall to control this migration. A flow rate of 50 gpm is estimated for these wells. Extracted groundwater will be treated in the same manner as described in Alternative 2.

The groundwater will continue to contact buried wastes and, therefore, the groundwater extraction system will need to operate in perpetuity. However, treatment may be discontinued if cumulative groundwater contamination levels of indicator chemicals do not exceed 10^{-6} lifetime cancer risk at the point of compliance.

Total Cost of Alternative 5: $14,410,000 (in net present worth)

Alternative 6: RCRA-Type Cap, Soil Remediation, Groundwater Monitoring

For remediation of landfill contents and surface soils, Alternative 6 is the same as Alternatives 4 and 5. For groundwater, Alternative 6 provides only groundwater monitoring to determine the amount and aerial extent of groundwater contamination and assess the long-term effectiveness of this remedy. Alternative 6 allows continued discharge of contaminated groundwater into the Kishwaukee River, as well as potential migration of contaminated groundwater beneath the river.

Monitoring of the aquifer, as a remedy, also prevents near-term use of the groundwater between the landfill and the river. Deed restriction will be necessary to ensure that the groundwater in this area is not used. A significant reduction in infiltration afforded by the RCRA cap may provide a more stable water level in the landfill allowing flushing to occur in this area. At some time in the future, this flushing action may reduce

contamination to allow limited use of the groundwater; however, operation and maintenance (O & M) will continue indefinitely.

Total Cost of Alternative 6: $5,990,000 (in net present worth)

Alternative 7: Sanitary Landfill - Type Cap, Soil Remediation, Groundwater Monitoring

This alternative is the same as Alternative 6, except that the multilayer cap over the landfill contents is a sanitary landfill cap rather than a RCRA cap. The sanitary landfill cover will eliminate surface runoff of contaminants, but it will only reduce the current rate of infiltration rather than eliminate it like the RCRA cap. It should be pointed out that although current sanitary landfill cap regulations are not performance based, as are the RCRA cap regulations, new sanitary landfill cap requirements, with an emphasis on cap performance, are expected to be published in the near future. One cap performance consideration is the thickness of the frost zone - the zone where freezing and thawing occur on a seasonal basis, potentially causing expansion and contraction cracks. In the Belvidere area the frost zone extends to a depth of 36 inches - a greater penetration than the entire sanitary landfill cap thickness. Therefore, under Alternative 7, as compared to Alternative 6, the decrease in groundwater contamination will not occur as quickly. Operation and maintenance of this remedy would be required to continue indefinitely.

Total Cost of Alternative 7: $3,170,000 (in net present worth)

Alternative 8: Limited Actions

Alternative 8 provides only limited actions for meeting remedial action goals. Limited actions include deed restrictions to control unaccepted on-site construction and activities, upgrade site fencing to restrict public contact with exposed waste, flood control measures to prevent erosion of those portions of the existing cover located in the 100-year flood plain, and groundwater monitoring, on-site as well as across the river from the site, to measure and locate the spread of groundwater contamination. These actions are also used in Alternatives 3, 4, 5, 6, and 7, in conjunction with their other remedial responses. However, here in Alternative 8, the limited actions are the only remedial response. Therefore, O & M of this remedy will continue indefinitely.

Total Cost for Alternative 8: $624,000 (in net present worth)

Alternative 9: No Action

Under the "No Action" alternative, IEPA and U.S. EPA would take no further action at the site to reduce contamination levels. Under this alternative, site wastes and contaminated soils, routes of off-site contaminant migration, and human and environmental exposure pathways will all remain unchanged. In addition, wastes will continue to contaminate the

groundwater via the infiltration of precipitation and the leaching of hazardous constituents. This alternative would not reduce the risks to human health and the environment. The No Action Alternative is always evaluated to provide a baseline of comparison for the other alternatives.

Total Cost for Alternative 9: $0

VII. SUMMARY OF THE COMPARATIVE ANALYSIS

The nine criteria used for evaluating the remedial alternatives listed above include: overall protection of human health and the environment; compliance with ARARs; long-term effectiveness; reduction of toxicity, mobility, or volume; short-term effectiveness; implementability; cost; State of Illinois and Community of Belvidere acceptance. Based on these nine criteria, the Agencies believe that the preferred alternative for remedial action at the Belvidere Municipal Landfill site is a variation of Alternative No. 3 - RCRA Subtitle C Cap, Soil Remediation, Plume Barrier Groundwater Extraction and On-Site Treatment (referred to hereafter as modified Alternative 3 with RCRA cap). The RCRA Subtitle C cap replaces the sanitary landfill cap because IEPA has determined that the hazardous waste landfill closure regulations of RCRA are relevant and appropriate at this site given that hazardous waste was disposed of and is being released from the landfill.

Overall Protection of Human Health and the Environment

Modified Alternative 3 with a RCRA Subtitle C cap would be protective of human health and the environment. Capping of the landfill contents and soil remediation will eliminate the direct human contact threat. It will also significantly reduce infiltration, prevent migration of contaminated materials to the Kishwaukee River and ponds. In addition, groundwater extraction and treatment will ensure that the groundwater is protective of the river. Deed restrictions would provide assurances that the groundwater between the landfill and the river will not be consumed. Groundwater monitoring wells would gauge the protectiveness of the extraction/treatment system on both sides of the river.

Alternatives 1, 2, 4, 5, 6 and 7 would also be protective; however, Alternatives 8 and 9 would not be adequately protective and are therefore not eligible for selection.

Compliance with ARARs

Modified Alternative 3 with a RCRA Subtitle C cap, soil remediation, and groundwater treatment and discharge system would meet all applicable or relevant and appropriate State and Federal environmental regulations.

Alternatives 1, 4, and 5 would also be compliant with the same ARARs under RCRA Subtitle C landfill closure and groundwater corrective action regulations, TSCA PCB disposal regulations, and Illinois' General Use Water Quality Standards. Alternatives 6 and 7 would also be compliant with these

ARARs except that these alternatives do not address clean up of releases to the groundwater. Therefore, RCRA groundwater corrective action requirements are not met.

In addition, Alternative 7 (and Alternative 3) only requires a sanitary landfill cap. However, since the site did accept hazardous waste while in operation and hazardous constituents are currently being released from the landfill to the groundwater, RCRA, Subtitle C capping requirements are the ARAR. Therefore, Alternatives 3 and 7 are not compliant with ARARs.

Alternative 2 would be ARAR compliant except that disposal of some untreated wastes may be prohibited by RCRA land disposal regulations.

Long-Term Effectiveness and Permanence

Modified Alternative 3 with a RCRA Subtitle C cap is comparable to Alternatives 4 and 5 in the long-term effectiveness and permanence it affords. All remedies involve possible treatment of any PCB contaminated soils identified, containment of remaining material and long-term treatment of groundwater.

Modified Alternative 3 with a RCRA Subtitle C cap provides long-term effectiveness and permanence greater than Alternative 6 and 7, which treat source material the same but do not treat groundwater; but less than Alternatives 1 and 2 which would eliminate site risks through treatment or disposal of source material and groundwater. Although Alternative 2 would provide long-term effectiveness and permanence in terms of removal of the source material, it would not meet these goals if viewed on a broader scale. Transfer of untreated waste to a regulated RCRA facility also transfers the need for long-term monitoring and does not provide a permanent solution.

Alternative 1 does provide both long-term effectiveness and permanence through incineration of source material. However, this alternative also requires that residual ash be disposed at another facility.

Current sanitary landfill cap regulations are not performance based, as are the RCRA cap regulations. Therefore, Alternative 3 with a RCRA Subtitle C cap includes a greater degree of control with the RCRA Subtitle C cap than those Alternatives utilizing a sanitary landfill cap.

Reduction of Toxicity, Mobility, or Volume

Modified Alternative 3 with a RCRA Subtitle C cap uses treatment to reduce mobility and volume of hazardous substances in the groundwater and toxicity, mobility and volume of PCB contaminated soils above 50 ppm which are incinerated. The level of treatment is comparable to other treatment alternatives with the exception of Alternative 1, which would significantly reduce toxicity, mobility and volume through incineration of the source material. Although Alternaive 2 would involve removal of the source material, it does little to reduce toxicity, mobility and volume of the waste through treatment.

Alternative 6 and 7 do little to reduce toxicity, mobility and volume of the wastes. Although the RCRA Subtitle C cap does not afford a reduction in toxicity, mobility and volume through treatment, it does significantly reduce infiltration (more than a sanitary landfill cap) and the production of leachate that could migrate off-site.

Short-Term Effectiveness

Alternatives 3-8 will take approximately one year to implement; however, the groundwater portion of the remedy will require continued operation for an extended period of time. Although Alternatives 1 and 2 require more time for implementation (6 years), long-term operation and maintenance is not required.

During cap construction and soil remediation some wastes will be exposed due to surface regrading. However, this can be effectively mitigated by careful construction techniques to minimize the working face of the regrading operations. The workers on-site will also have appropriate personal protection.

In general, capping of the landfill will pose much less short-term risk to the community during construction than the excavation of landfill contents. The five year period required for excavation could result in increased noise, noxious odors, exposure of wastes to transport via wind and water, and traffic disturbances.

Implementability

Alternatives 1 and 2 involve excavation of the entire landfill with disposal at an on-site incinerator or off-site landfilling, respectively. Implementation concerns associated with off-site landfilling involve availability of off-site disposal capacity and prohibition of disposal due to land disposal regulations. On-site incineration implementation may be hampered by the variability and relatively high metal content of the waste. Disposal of incinerator ash at a licenced RCRA facility will be necessary; however, disposal capacity is limited and may impede the implementability of this action.

Alternatives 3, 4, 5, 6 and 7 involve capping the landfill. Construction of the cover is technically feasible, although there will be some minor concerns about waste disturbance during construction. Construction of a RCRA Subtitle C cap instead of a sanitary landfill cap will provide a greater challenge if synthetic liners or membranes are required. These concerns can be effectively mitigated by careful construction techniques.

Groundwater lowering and a slurry wall were considered in Alternatives 4 and 5, respectively, as part of the groundwater extraction system. The groundwater lowering system would lower the water table below the base of the landfill. However, induced infiltration from the west pond, makes it uncertain that this lowered elevation can be maintained under all areas of the landfill.

The site conditions make implementation of a slurry wall uncertain. In particular, the subsurface sands, shallow groundwater, large depth to bedrock, and lack of an impermeable barrier between the bedrock and the contaminated aquifer raise questions as to the implementability of Alternative 5.

The plume barrier system of the modified Alternative 3 with a RCRA Subtitle C cap extracts groundwater which is then treated prior to discharging into the Kishwaukee River. The groundwater treatment system would be designed with conventional treatment technology to meet appropriate discharge limits. Design approvals will be required from several Federal and State offices in order to ensure that technical requirements are met. Once design is complete, construction is expected to take only one construction season.

Cost

Alternatives 1 and 2, excavation of all landfill contents, are by far the most costly alternatives with present worth costs estimated at $127,550,000 and $173,280,000, respectively.

To determine the cost of modified Alternative 3 with the RCRA Subtitle C cap instead of the sanitary landfill cap, one must subtract the cost of the sanitary landfill cap ($1.913 million) from the present worth cost and add to it the cost of the RCRA Subtilte C cap ($4.241 million) to get a present worth cost of $7,948,480.

Modified Alternative 3, RCRA Subtitle C cap and plume barrier system, Alternative 4, RCRA Subtitle C cap and groundwater lowering system, and Alternative 5, RCRA Subtitle C cap and slurry wall system offer somewhat more comparable costs at $7,948,480, $22,860,000, and $14,410,000, respectively.

Capping and groundwater monitoring under Alternatives 6 and 7 would cost $5,990,000 and $3,170,000, respectively. Limited action under Alternative 8 would cost $624,000.

Community Acceptance

This site has not seen a significant amount of community involvement. Since the City of Belvidere is a Potentially Responsible Party (PRP), the citizens seemed particularly concerned with the cost of the remedy.

Comments provided by the PRPs suggest that the actions proposed by the Agency in this Record of Decision are reasonable, but expensive. Instead of on-site groundwater treatment and discharge to the Kishwaukee River, they suggest that extracted groundwater be discharged to the Belvidere POTW. In addition, they suggest that the RCRA Subtitle C compliant cap can be provided more cheaply and as effectively by means other than the design provided in the FS. This Record of Decision specifies a performance based response to the RCRA Subtitle C compliant cap. The PRPs can offer alternative means of achieving the goal in the design phase. All significant comments are addressed in the attached Responsiveness Summary.

State Acceptance

The Illinois Environmental Protection Agency (IEPA) played a major role in the RI/FS process as the lead agency, and concurs on the selected remedy. IEPA also recognizes their 50% cost share and O & M responsibilities.

IEPA believes that the modified Alternative 3 - RCRA cap, soil remediation, and groundwater extraction and treatment via a plume barrier system - presents the best balance among the nine evaluation criteria.

VIII. SELECTED REMEDY

Based on current information U.S. EPA and IEPA prefer a variation on Alternative 3 -- RCRA Subtitle C cap, soil remediation, groundwater extraction and treatment via a plume barrier system, monitoring, access restriction and flood protection -- as the most appropriate final solution for the Belvidere Municipal Landfill site. (This final remedy is referred to as; modified Alternative 3 with a RCRA Subtitle C cap.)

RCRA Subtitle C Cap

This cap will be designed in compliance with RCRA Subtitle C landfill closure requirements (40 CFR §264.310 (a)). A gas venting system may also be required to relieve pressure due to gas buildup beneath the cap. The venting system would need to be assessed to ensure that it did not present a risk to human health or the environment.

Waste, which is currently uncovered or protruding from the landfill, would be covered in the course of regrading the surface. A minimum working face will be maintained during surface regrading in order to minimize the potential airborne release of contaminants. This will ensure that work completed at the site would be done in a manner that would minimize risks to workers and nearby residents.

This component of the remedy has a capital cost of approximately $3.57 million.

Soil Remediation

Soils in the drum disposal area, adjacent to the northwest edge of the landfill will require remediation. These soils will be resampled to confirm existing data on PCB concentrations.

- o If the soil samples indicate PCB contamination greater than 50 parts per million (ppm):
  - That soil would be taken to an off-site incinerator, thus ensuring permanent reduction of contaminant toxicity, mobility and volume or;
  - The soil would be left in place and capped with a soil cover.

- o If the soil samples indicate PCB contamination less than 50 ppm, then soils can be consolidated with the landfill material prior to capping.

The capital cost for this portion of the remedy is estimated to be $28,800. This cost is based on the most expensive alternative of excavating to soil and transporting it off-site for incineration.

Groundwater Extraction and Treatment

Extraction of contaminated groundwater will occur through a plume barrier system of wells located downgradient of the landfill. This system will be designed to intercept contaminated groundwater before it reaches the Kishwaukee River. Total flow of extracted groundwater is expected to be 100 gpm; however, specific parameters of the extraction system will be determined during design.

Extracted groundwater would be treated on-site with final disposal of the effluent to the Kishwaukee River, or alternatively, on-site pretreatment if necessary, with disposal to the City of Belvidere Treatment Plan for subsequent treatment. Pilot and bench scale treatment plants will be developed to determine actual system design and performance.

If extracted groundwater is to be discharged to the Kishwaukee River, the effluent must meet State of Illinois NPDES permit conditions. If extracted groundwater is to be discharged to the Belvidere POTW, the effluent must meet the POTW local limits.

If an air stripper is included in the treatment system, a risk assessment will be performed to ensure the effluent is protective of human health and the environment. Treatment may be discontinued if cumulative groundwater contamination levels of indicator chemicals do not exceed 10^{-6} lifetime excess cancer risk at the point of compliance. The boundary of the waste management unit - in this case the landfill boundary - is considered the point of compliance for groundwater.

The capital cost of this portion of the remedy is estimated to be $407,000.

Monitoring

- o Groundwater/Surface Water

The purpose of groundwater monitoring is to track the location of contaminated groundwater and to measure the effectiveness of remedial measures. The FS suggests eighteen sampling sites for monitoring. They consist of thirteen existing monitoring wells located in the fill, downgradient in the plume, upgradient for background and in bedrock; two sites in the West Pond; and three new monitoring wells located on the west side of the Kishwaukee River. These latter wells are intended to determine whether or not contaminated groundwater is passing under the river. The actual monitoring system will be determined during design.

Samples will be taken from the sampling sites twice per year. Each sample will be analyzed for a list of parameters that will be determined during the design phase.

The cost for monitoring is estimated to be $1,350/sample. For the 18 sites, measured twice per year, the total annual cost is estimated to be $48,600. Construction of the three new monitoring wells is estimated to have a capital cost of $17,000. Should the groundwater results remain relatively consistent over time, monitoring may not need to be as extensive.

o Fish

Based on the lack of quality fish analysis data, conclusions regarding risks associated with the consumption of fish could not be made. Additional monitoring of the fish in the two ponds and the Kishwaukee River are necessary. Sampling and analysis of the fish should occur on an annual basis.

If analyses indicate that fish consumption poses little or no risk to human health, sampling and analysis could be discontinued.

Access Restriction

The access restrictions include an upgraded fence to preserve the integrity of the cap and prevent recreational use of the landfill, and deed restrictions to control unacceptable on-site construction and activities. Capital costs for the fence and deed restriction will be $64,000 and $10,000, respectively.

Flood Protection

Flood control measures are needed to prevent erosion of the cap material and landfill contents. This feature will be designed and constructed to minimize impacts on the floodplain and adjacent wetlands. For the purposes of cost estimation, it is anticipated that extra layers of compacted clay and vegetated soil along the northwest and southwest borders of the cap are required to provide protection to the underlying material. The FS estimates that the extra layers would extend outward 10 feet from the toe of the slope for approximately 2,800 feet along the western edge of the landfill. Capital costs are estimated to be $80,700.

This alternative is believed to offer the best balance of tradeoffs among the nine criteria in affording prompt protection of human health and the environment through readily implementable means at reasonable costs. The capital cost for this remedy is $5.9 million, the annual operation and maintenance is $271,000 and total present worth is $7.9 million.

designed to apply to landfills. The Belvidere Municipal landfill has similar characteristics to Subtitles C and D such that both laws are considered relevant.

The State of Illinois has jurisdiction for Subtitle D, sanitary landfill operation and closure laws. This is covered by the Illinois Administrative Code (IAC) Title 35: Environmental Protection Subpart G: Waste Disposal. This regulation applies to those facilities which operated in accordance with the stated requirements and did not accept hazardous waste. The existing regulation is fairly general and relies on guidance and final approval of the permit writer. This cap seeks to minimize infiltration by specifying clay type, and promote drainage by specifying sloping and topsoil requirements.

RCRA Subtitle C requirements for caps are applicable to those hazardous waste disposal facilities which operated after promulgation of the regulation in 1980 and/or were granted interim status to operate in the manner provided by the regulation. This regulation requires that the cap minimize liquid migration, minimize maintenance, promote drainage, accommodate subsidence and be less permeable than the bottom liner. In addition, guidance and permit writer approval will determine the final cap design based on site-specific characteristics. Since waste from regrading and possible soil remediation will be consolidated on-site, placement will not occur and thus RCRA Land Ban Requirements will not be triggered.

Distinguishing which cap regulation is most appropriate when both are relevant, requires a review of site-specific characteristics. Although the Belvidere site has been referred to as a municipal landfill, the site did accept hazardous waste while in operation. Also, hazardous constituents are currently being released from the landfill to the groundwater. Hazardous constituents, although not uncommon in relatively low levels, typically do not occur in sanitary landfills at the relatively high concentrations found at the Belvidere site. Therefore, the Subtitle C, RCRA capping requirements are the most appropriate.

o Soil Remediation

This portion of the remedy is driven by the Toxic Substances Control Act (TSCA). TSCA 40 CFR 761.60(a)(4) requires that materials disturbed or excavated which contain 50 ppm or greater PCBs be disposed at a landfill authorized under 40 CFR §761.75 or an incinerator authorized under 40 CFR §761.70.

For those materials containing 50 ppm PCBs or greater, disposal will occur at a TSCA compliant facility. However, if subsequent analysis determines that the soils contain less than 50 ppm PCBs then the contaminated material will be consolidated on the landfill prior to capping.

- Groundwater Extraction and Treatment

  RCRA Subpart F regulations apply to releases from solid waste management units (SWMU). Given that RCRA Subtitle C landfill closure has been determined to be relevant and appropriate and the Belvidere municipal landfill (SWMU) is currently releasing hazardous constituents to the groundwater, it has been determined that RCRA Subpart F is also relevant and appropriate. The point of compliance (40 CFR §264.95), at which groundwater cleanup standards are to be applied is the 19.3 acre landfill boundary. The groundwater extraction and treatment system will operate until groundwater no longer exceeds a 10^{-6} cumulative life-time cancer risk at the point of compliance.

  RCRA Section 3008(h) and Section 3004(u) and (v), provide U.S. EPA the authority to order corrective action at a facility operating pursuant to RCRA from which a release of hazardous waste or hazardous waste constituents has occurred. The RCRA corrective action authority is relevant and appropriate to the site, as groundwater sampling has documented releases from the hazardous waste landfill.

  Groundwater treatment and subsequent disposal will be regulated by the National Pollutant Discharge Elimination System. Discharge of treated groundwater to the Kishwaukee River shall not exceed applicable Illinois General Use Standards (IAC 35: §302.208) and one-tenth 96-hour TLm criteria (IAC 35: §302.210) at the 10^{-5} cancer risk level. Discharge to the Belvidere POTW must meet the requirements of the City of Belvidere's sewer use ordinance, which includes general prohibitions and numerical limits covering various organics, ammonia and metals.

- Floodplain and Wetlands Protection

  U.S. EPA has a floodplains and wetlands policy which regulates construction in a floodplain (similar to RCRA 40 CFR 270.14(b)(ii)(iv)) and filling of wetlands (40 CFR Part 230). The impacts that Alternatives may have on wetlands, located in the borrow area west of the landfill, and the floodplain, which ends at the western edge of the landfill, are expected to be minimal -- less than 0.5 acres and will not require mitigation. Impacts to both the wetlands and floodplain will be considered and minimized to the maximum extent practical during the design phase of this project.

- Endangered Species

  The Belvidere Municipal Landfill site adjacent to the Kishwaukee River is a potential summer habitat for Indiana Bats. The Indiana Bat is a Federal Endangered Species and is therefore protected under the Federal Endangered Species Act.

To determine the presence or absence of the Indiana Bat on the Belvidere site, a bat survey will need to be performed. If bats are found to use the area as a summer habitat - they tend to live in dead or dying trees along small river corridors - then construction involving removal of trees could not be performed between May 1 and September 1. However, if no bats are found on the site, construction can continue without interruption.

Cost Effectiveness

Although this remedy leaves behind material that poses risks that must be managed, the more permanent solutions -- on-site incineration or off-site disposal -- are so much more costly, contain technical uncertainties and a greater chance of posing short-term risks for the Belvidere site that they are not preferred. Modified Alternative 3 with a RCRA Subtitle C cap also offers an advantage over other containment alternatives in that it provides for protection of the river and groundwater for the least cost.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

This alternative offers the best balance of tradeoffs among the nine criteria in affording prompt protection of human health and the environment through readily implementable means at reasonable costs. This remedy represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

Preference for Treatment as a Principal Element

Treatment of the principal threats of the site was not found to be practicable. Therefore, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The size of the landfill and the fact that there are no on-site hot spots that represent the major scurces of contamination preclude a remedy in which contaminants effectively could be excavated and treated.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

APPENDIX A

BELVIDERE MUNICIPAL NO. 1 LANDFILL

RESPONSIVENESS SUMMARY

BELVIDERE MUNICIPAL NO. 1 LANDFILL
BELVIDERE, ILLINOIS
RESPONSIVENESS SUMMARY

I. RESPONSIVENESS SUMMARY OVERVIEW

In accordance with CERCLA Section 117, the United States Environmental Protection Agency (U.S. EPA) and the Illinois Environmental Protection Agency (IEPA) recently held a public comment period from May 2, 1988 to June 6, 1988, for interested parties to comment on U.S. EPA's Proposed Plan and Feasibility Study for addressing contamination problems at the Belvidere Municipal Landfill site. At the public meeting, held on June 2, 1988, U.S. EPA and IEPA presented their Proposed Plan for the Belvidere Municipal Landfill site.

The purpose of this responsiveness summary is to document U.S. EPA's and IEPA's responses to comments, criticisms and new data received during the public comment period. All of the comments summarized in this document were considered prior to U.S. EPA and IEPA's final decision.

II. BACKGROUND ON COMMUNITY INVOLVEMENT

The Illinois Environmental Protection Agency (IEPA) has been responsible for conducting a community relations program for this site. A community relations plan was submitted to and approved by the U.S. EPA in June, 1984. The emphasis of this first phase of the community relations program was directed at one-to-one contact and informal meetings with local officials and citizens responding to community concerns about groundwater contamination of private wells along Appleton Road and migration of hazardous waste to other areas of the environment that may threaten the public health and the environment. Periodic sampling and analyses of non-community source wells and private drinking water wells were coordinated between the City, County, State and Federal agencies including U.S. EPA and IEPA.

Early in the Remedial Investigation, the Community Relations Coordinator identified the need to provide strong coordination between the City and County agencies. The coordinator acted as liaison between the Mayor, Boone County Conservation District Executive Director, and the County Public Health Administrator who represented the County and public health concerns of the residents. Because of the cooperation with public officials, public concerns were identified early in the process.

Roger Gustafson, Executive Director of the Boone County Conservation District, voiced concerns about the drinking water quality in Spencer Park which is southeast of the landfill. Mr. Gustafson was concerned that users of the park might not be aware that there may be contamination in these wells coming from the landfill. IEPA sampled all three wells in the park and found low levels of contamination in one of them. Although only one toxic chemical was found in this well, it was not one of the hazardous chemicals found at the landfill.

Appleton Road residents are extremely concerned about contamination of their well water from the landfill. Discussions with residents revealed the origin for this concern. In 1962, the Illinois Department of Public Health found that some of the wells along Appleton Road were contaminated. The source of contamination may be coming from another site located upgradient of Appleton Road and the park. The IEPA has initiated a preliminary assessment of the site and soon the site will be scored for possible future action. Milestone activities conducted by Community Relations during the remedial investigation include:

- Notification letters
- Press briefings to explain site history and Superfund program
- News release announcing the start of the remedial investigation and feasibility study
- Informal meetings with area residents and local City and County officials
- Fact Sheet #1 explaining history and problems at the site
- Public meeting to discuss cleanup process - early in Remedial Investigation phase
- Fact Sheet #2 explaining Drum Removal
- Informal Meetings with various community group to introduce RI results
- Proposed Plan
- Public Hearing to receive comments on Administrative Record

Approximately 40 people attended the public hearing. Formal comments were given by Mayor Terry Gratz, Robert Wilson, Louise Miles, and Bud Heinz. The oral response to each comment or question is provided in the official meeting transcript.

All formal written comments were received from the Appleton Road Committee (ARC).

III. SUMMARY OF SIGNIFICANT COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND U.S. EPA AND IEPA RESPONSES

The comments are summarized and organized into the following categories:

I. Summary of Public Hearing Comments

- A. Comments on the Remedial Investigation
- B. Comments on the Feasibility Study and Proposed Plan
- C. Comments on Enforcement Issues
- D. Miscellaneous

II. Summary of Significant Written Comments

- A. Comments on the Remedial Investigation
- B. Comments on the Public Health and Environmental Assessment
- C. Comments on the Feasibility Study and Proposed Plan
- D. Miscellaneous Comments

The comments are paraphrased in order to effectively summarize them in this document. The reader is referred to the actual reports and comments available at the public repository.

I. SUMMARY OF PUBLIC HEARING COMMENTS

A. COMMENTS ON THE REMEDIAL INVESTIGATION

COMMENT:

Which way is the groundwater moving from the site?

RESPONSE:

The groundwater is moving in a southwesterly direction from the site towards the river and does not effect private wells along Appleton Road.

COMMENT:

How did the contractor determine which way the groundwater is flowing?

RESPONSE:

Weston installed several monitoring wells and measured the groundwater levels in each one. The direction of groundwater flow is from wells with higher levels toward wells with lower

levels. In the case of the Belvidere Landfill No. 1, monitoring wells indicate that the groundwater moves from the northeast to the southwest toward the Kishwaukee River.

COMMENT:

How long will the groundwater moving from the landfill to the river have to be pumped and treated?

RESPONSE:

The groundwater from the landfill will have to be pumped and treated until the concentration levels of hazardous waste are reduced to an acceptable cancer risk level for humans. The exact amount of time cannot be determined at this time.

COMMENT:

Has the groundwater from the fill reached the river?

RESPONSE:

Surface water samples confirm that hazardous constituents have already reached the river. The shallow groundwater moves approximately 254 feet per year which means it takes 4 1/2 years for the contaminated leachate under the landfill to reach the river.

COMMENT:

How much cover is currently over the landfill?

RESPONSE:

The current sand cover ranges from 2 to 3 feet on the top of the landfill. The edges of the landfill are covered with approximately 0 to 6 inches of sand cover. The type and amount of cover material currently on the landfill is not adequate to prevent surface water from infiltrating through the landfill and contaminating the groundwater.

COMMENT:

Is the landfill in Spencer Park?

RESPONSE:

No. The landfill is northwest of Spencer Park. Since the groundwater flow is to the southwest, the Belvidere Municipal Landfill site does not impact the wells in the park.

COMMENT:

Does the EPA know what kinds of chemicals are in the landfill?

RESPONSE:

We can't be sure that we know everything that's in the landfill, but a full battery of tests were conducted by Weston to determine the hazardous constituents in the landfill. These tests included sampling and analysis of the groundwater on three separate occasions. The hazardous chemicals that were identified, have been considered in the remedial action decision.

B. COMMENTS ON THE FEASIBILITY STUDY AND PROPOSED PLAN

COMMENT:

How feasible is the proposed remedy?

RESPONSE:

The proposed remedy is very feasible. All technologies to be used are proven and are currently being utilized at numerous State and Federal Superfund sites.

COMMENT:

What is the maintenance cost on the proposed remedy?

RESPONSE:

Present worth cost of the proposed remedy includes capital costs on construction, and maintenance and operation costs for the next 30 years. These cost figures have been conservatively set to allow for unforseen events. The estimated annual operation and maintenance cost is $ 271,000.

COMMENT:

Will the groundwater be monitored all around the site?

RESPONSE:

Yes. A number of existing monitoring wells will be utilized on and around the site, and additional wells will be put in across the Kishwaukee River to determine if the groundwater is flowing under the river.

COMMENT:

Will the houses along Appleton Road be sampled to see if their wells have become contaminated?

RESPONSE:

At this time there are no plans to sample residential wells along Appleton Road since it has been determined that the Belvidere Landfill site does not impact the upgradient area along Appleton Road. However, monitoring of groundwater on the west side of Appleton Road will continue.

COMMENT:

Has the Agency looked at biological degradation for volatile organics as one of their alternatives?

RESPONSE:

Although biological degradation of organic waste is technically feasible and was considered in the FS, the landfill also contains other types of waste which can't be treated by this method.

C. COMMENTS ON ENFORCEMENT ISSUES

COMMENTS:

Who will pay for the cleanup at the Belvidere Municipal No. 1 Landfill?

RESPONSE:

The U.S. EPA expects that all identified potentially responsible parties including generators and transporters of hazardous waste as well as owners and operators of the landfill will pay for the cleanup. However, if negotiations are unsuccessful, U.S. EPA and IEPA will proceed with their remedy and pursue cost recovery at a later date.

COMMENT:

If the U.S. EPA regulations change for the multi-layer hazardous waste cap, will the taxpayers have to pay for the upgrade of the cap?

RESPONSE: .

As long as the cap does the job of preventing surface water from penetrating into the landfill contents, there will be no need to upgrade it. However, the cap will require continued maintenance to keep it in good condition.

COMMENT:

What happens to people who don't respond to the §104 notice letters?

RESPONSE:

The U.S. EPA Enforcement Section is actively engaged in pursuing information on Potentially Responsible Parties at the Belvidere Landfill site. The Enforcement Section will continue to investigate the people who may have prior knowledge of the owners, operators, transporters and generators of hazardous waste brought to the landfill. The §104 notice inquiry letter is just one way this can be accomplished.

COMMENT:

Is the list of people who were sent the 104 inquiry notices available to the public?

RESPONSE:

Yes. Under the Freedom of Information Act, this list of people is available to the public by sending a letter to the U.S. EPA requesting this information.

D. **MISCELLANEOUS COMMENTS**

COMMENT:

Is the County liable if there is a private well permit issued to a resident, and there is contaminated water found in that well?

RESPONSE:

The Boone County Health Department issues well permits and inspects the construction of the well to see that it is constructed according to State and local codes, but this is no guarantee that a resident's water is safe to drink.

COMMENT:

How will the current property owner's concerns be addressed by U.S. EPA during the design phase?

RESPONSE:

The Boone County Conservation District should voice their concerns to the Agencies during the design phase of the cleanup. Their concerns will be considered during the design and remedial action phases.

II. SUMMARY OF SIGNIFICANT WRITTEN COMMENTS

A. COMMENTS ON THE REMEDIAL INVESTIGATION

1. COMMENTS ON SITE GEOLOGY

COMMENT:

A vertical cross-section illustrating the geological interpretations developed by ARC was provided, including the suggestion that the lower portion of the sand and gravel aquifer represents Winnebago or Glasford Till Formations.

RESPONSE:

The commentors interpretation of the geologic cross-section is similar to that found in the RI. The only significant variation is ARC's interpretation of the lower portions of the sand and gravel aquifer. Given that the interpretation of this portion of the aquifer is based on data from one bore hole, any interpretation is subject to uncertainty. The RI appendix shows that some portions of the lower sand and gravel aquifer are characterized by poorly sorted sandy gravels and gravelly sands. Poor sorting is a characteristic of glacial tills commonly found in the Belvidere area. Therefore, it is possible that the lower portion of the sand and gravel aquifer is made up of Winnebago and/or Glasford Formation glacial till and outwash deposits.

COMMENT:

The Troy Bedrock Valley is present in the area beneath the site (Berg et al, 1984, Figure 10). The dimensions and orientation of the tributary valley beneath the site are unknown, although regional data indicates that the valley drained toward the northwest.

RESPONSE:

The Belvidere Municipal Landfill site sits over the eastern edge of the Troy Bedrock Valley. According to Berg et al. (1984, page 11), the bedrock valley trends south - southwest, not northwest. The valley is approximately 2-3 miles wide and has up to 400 feet of vertical relief.

RESPONSE:

2. COMMENTS ON SITE GEOHYDROLOGY

COMMENT:

ARC states that there is an upward vertical component of hydraulic gradient, measured from the bedrock to the water table, indicating that the river is a discharge zone for the upper aquifer and at least the upper portion of the lower bedrock aquifer.

RESPONSE:

This statement is not supported by the RI. The RI states on page 7-18 that vertical gradients between the deep and shallow wells are very slight; water levels vary by no more than a few tenths of a foot at the locations measured. These vertical gradients appear to be, at least in part, a function of the wells' proximity to the river and seasonal fluctuations in the water table. This suggests that discharge from the deeper part of the sand and gravel aquifer to the river may occur during certain times of the year near the river. However, these data are too limited to say with certainty whether groundwater in the lower sand and gravel aquifer is discharging to the river or flowing beneath the river in the vicinity of the site. The RI does not suggest that any portion of the bedrock aquifer discharges to the Kishwaukee River. The RI does suggest that monitor wells be placed on the opposite side of the Kishwaukee River to better define the flow characteristics of the lower sand and gravel aquifer.

COMMENT:

The upward vertical hydraulic gradient would act to maintain contaminants at, or near, the groundwater surface. This would tend to keep contaminants from entering the fractured bedrock where extraction would be difficult, and reduces the depth to which extraction wells would have to be installed in the upper aquifer.

RESPONSE:

The presence of chromium in the bedrock well indicates that the bedrock is not acting as an aquaclude and that vertical migration of the contaminated groundwater may occur. Contamination has been detected in wells completed to a depth of 40 feet into the upper aquifer. Therefore, extraction wells will need to be installed deep enough to intercept this contamination.

COMMENT:

Several minor errors were made in the analysis of test results presented in the RI. The value of L should be the length of well screen below the water table, not necessarily the total length of screen which is shown in Appendix L of the RI. Also, Bouwer and Rice (1976) state that the analysis is semi-empirical and that the value of the term $\ln[(D-H)/r]$ should not be allowed to exceed 6. Every value of this term presented in Appendix L exceeds 6 and the larger value shown in the table was erroneously used to compute hydraulic conductivity. However, the impact of these errors on test results was small.

RESPONSE:

The agencies agree that value of L should be the length of the well screen below the water table, not necessarily the total screen length as described in Appendix L of the RI. The agencies also acknowledged that the value of the term $\ln[(D-H)/r]$ should not exceed 6.

Some of the values of L used in the RI were larger than the saturated screen length by one or two feet. In addition, the values used for $[(D-H)/r]$ all exceed 6, ranging from 6.54 to 7.20. The values utilized for these parameters varied only slightly from the actual, therefore, the agencies agree with ARCs conclusion that the impact of these errors on the test results is minimal.

COMMENT:

The bail-down test has the advantage of providing a rapid means of estimating hydraulic conductivity in a small diameter monitoring well. However, due to the limitations of the test method and the simplifying assumptions made by Bouwer and Rice (1976) in developing the analysis, the hydraulic conductivity and related travel time values presented in the RI should be considered approximate. They are expected to be of the correct order of magnitude and are considered adequate for the purposes of the RI and FS, but are not expected to be adequate for design.

RESPONSE:

As the commentors have stated, the purpose of the bail-down test is to provide a rapid and inexpensive means of estimating hydraulic conductivity. The agencies agree that the method has some limiting assumptions, as do most test methods in the field of hydrogeology. However, the results are considered sufficient for the purposes of the RI/FS. If more specific hydraulic conductivity data is needed it can be determined during design.

3. Comments on Site Geochemistry

COMMENT:

ARC commented that there was no discussion in the RI on duplicates, laboratory qualifiers, cation exchange, capacity and percentage of organic carbon in soils. However, the commentors concluded that the chemical analyses, particularly those performed by Weston, and the final reporting of chemistry data are of a high standard.

RESPONSE:

The percentage of organic carbon in soil and cation exchange capacity were not part of the Quality Assurance Project Plan.

The Agencies feel that although the laboratory qualifiers were not discussed in the text, they were adequately defined on the analytical data tables. The Agencies believe that the absence of these QA/QC discussions has no effect on the quality of the data presented in the RI, and agrees with ARC that the chemistry data are of a high standard.

COMMENT:

Because the reported detection of xylenes at MW-03 was not confirmed by the subsequent phases of sampling and analysis and because of the lack of other organic compounds in that well, there is a possibility that this reported detection was due to an artifact of sampling or analysis and not of groundwater contamination.

RESPONSE:

Although it may be possible that the xylene in MW-03 was due to an "artifact of sampling or analysis", the Agencies believe it is likely that the xylene detected in MW-03 is due to groundwater contamination. Xylene was detected in other shallow wells (MW-07 and MW-19) immediately upgradient from MW-03 during phase 1. Therefore, the relatively low level found in MW-03 may actually reflect the edge of the plume.

COMMENT:

4-methyl-2 pentanone was not reported in either the duplicate of the sample or in the "diluted" aliquot obtained from the same well (MW-09) during the first phase. The presence of this ketone is not supported by the duplicate or "diluted" aliquots and should therefore be ignored.

RESPONSE:

Although the duplicate and "diluted" aliquots for GW-09 phase 1 did not detect 4-methyl-2 pentone, the actual sample (GW-09-01) did detect this constituent. The laboratory did not qualify this data therefore, the presence of this ketone will not be ignored.

COMMENT:

Chloroform is listed in Table 5-16 of the RI among the other volatile organics, but no detection of chloroform was reported in any of the groundwater samples. This compound should therefore be ignored as a constituent of the groundwater at this site.

RESPONSE:

The RI does not state that chloroform is a constituent of the groundwater at this site.

COMMENT:

Trans-1,2-dichloroethene was only found in well MW-25 during phase 2 and 3 sampling. The compound was not reported in any other well or matrix during this investigation. Although it may have been transported through the groundwater from the site as trans-1,2-dichloroethene or a parent compound, a more likely explanation is that its occurrence has beer caused by an isolated spill and its presence is therefore not indicative of contaminant migration from the landfill. The possibility also exists that this contaminant is associated with the river rather than the landfill.

RESPONSE:

The RI addressed the fact that vinyl chloride and trans-1,2-dichloroethene was detected only in MW-25 at this site. The RI states that there are three possible explanations of the presence of trans-1,2-dichloroethene and vinyl chloride in well MW-25: 1) it is the trailing edge of a plume that originated in or near the landfill: 2) it has the same origin as the tetrachloroethene, trichloroethene and 1,1,1-trichloroethane that is present in the Spencer Park wells and

it has the same origin as the tetrachloroethene, trichloroethene, and 1,1,1-trichloroethane that is present in the Spencer Park wells and it has migrated to MW-25 in groundwater and by way of the Kishwaukee River.

The first explanation, that the chlorinated compounds in MW-25 originated in or near the landfill, is supported by the presence of chlorinated aliphatic compounds in soils at the drum disposal area. However, the other groundwater data weaken this explanation. Trans-1,2-dichloroethene and vinyl chloride have not been detected in any of the other monitoring wells, including MW-24, the shallow well nested with MW-25. The approximately rate of groundwater flow, 254 ft/yr, is such that the compounds in MW-25 could be the trailing edge of a plume. This hypothesis implies substantially different mobilities for vinyl chloride and trans-1,2-dichloroethene than those compounds detected below and just downgradient of the landfill (i.e., benzene, toluene, xylene).

The second explanation, that the compounds in MW-25 are degradation products of the contamination in Spencer Park and that they migrated to MW-25 solely in groundwater, is supported by the nature of the Spencer Park contamination; but, it is weakened by the data regarding the nature and direction of groundwater flow is essentially straight toward the river. This is probably the flow direction at Spencer Park. Thus, if the contaminants were to migrate northwest from Spencer Park to well MW-25, the migration would have to occur in a different, deeper flow system within the outwash deposits. However, data from wells in the vicinity of the landfill at a depth comparable to that of MW-25 also indicate flow essentially straight to the river. Overall, this explanation is not considered to be very likely.

The first explanation appears to be best supported by the data and by reasonable interpretations of possible migration pathways.

COMMENT:

The VOCs of demonstrated significance for the site, and those for which groundwater cleanup objectives should be developed, are those found within the landfill itself: benzene, ethylbenzene, toluene and total xylenes.

RESPONSE:

The Agencies agree that benzene, ethylbenzene, toluene and total xylenes present a problem at the site. Cleanup objectives have been set for these and other constituents

detected at the site. These objectives call for continued extraction of groundwater until it no longer presents a 10^{-6} excess cancer risk. The risk will be based on indicator chemicals including, but not limited to: benzene, ethylbenzene, toluene, and total xylene.

COMMENT:

Certain semivolatile organic compounds (PAHs and PCBs) are associated with the landfill. Concentrations reported in groundwater are artificially high due to the sorption of the compounds onto soil particles which are then analyzed along with (unfiltered) groundwater.

RESPONSE:

PCB and PAH groundwater samples were not filtered. This procedure is generally followed under typical PCB and PAH sampling plans and should not result in significant higher concentrations in samples with relatively low total suspended solids (TSS).

However, the samples (MW15-02 and MW-15-03) with the most significant concentrations of PAHs do not have any detectable amounts of TSS although some PCB samples have appreciable amounts of TSS, there are samples with none. Finally, the Agencies agree that under optimal conditions drinking water wells are completed in such a way as to reduce or eliminate TSS. However, one cannot assume that this is always the case.

Therefore, the Agencies believe that the concentrations of PCBs and PAHs reported in groundwater are representative of actual contamination in the groundwater.

COMMENT:

Bis(2-ethylhexyl) phthalate was reported in background and blank samples and should be eliminated from consideration of downgradient groundwater contamination at the site.

RESPONSE:

The RI does not state that this compound is considered in downgradient groundwater contamination at the site.

COMMENT:

A concentration of 0.01 microgram per liter was reported for Alpha-BHC in sample GS-11-02, and a concentration of 0.02 microgram per liter was reported for Gamma-BHC in GW-25-01. These pesticides were reported during the phase 2 sampling effort and qualified by the laboratory as estimated values. They were not detected in any other sampling matrix at the site and should not be given any further consideration.

RESPONSE:

The single detection of Alpha-BHC, in sample GS-11-02, was qualified as "estimated" and "duplicate not within control limits". Therefore, the Agencies believe that this parameter is not considered significant to the site. Gamma-BHC was also qualified as "estimated" and did not show up in subsequent sampling events and as a result is not considered significant to the site.

COMMENT:

Contrary to the statement on page 5-76 of the RI, PCBs were not reported in well MW-25 as indicated in Table 5-22 on page 5-74 of the RI. The statement on page 5-76 of the RI that "This is an indication that there is horizontal migration of PCBs from the landfill to the river, since PCBs are not present in upgradient river samples" is greatly weakened by the lack of PCBs being reported in any well adjacent to the river.

The lack of any PCBs being reported in the groundwater during the first phase of sampling and the lack of reported PCBs in phase 3 groundwater sampling except in or adjacent to the landfill further weakens the hypothesis that PCBs are migrating to the river.

RESPONSE:

The Agencies agree that PCBs were not detected in MW-25. However, PCBs were detected during phase 2 and 3 in downgradient wells. Although significant groundwater transport of PCBs to the river is unlikely, overland flow and transport of PCB contaminated site soils to the river (and ponds) has occurred.

COMMENT:

Manganese, chromium and cyanide are mentioned on page 5-96 of the RI as not passing standards contained in Table 5-10 of the

RI. The concentrations of manganese and chromium reported in all filtered groundwater samples are below 1000 micrograms per liter. There is not sufficient evidence to include cyanide for remediation at present.

RESPONSE:

The RI states that manganese exceeds its secondary MCL of 50 micrograms per liter and chromium exceeds its primary MCL of 50 micrograms per liter. The RI does not state that cyanide exceeds any drinking water standards.

COMMENT:

During a spot check of inorganic results the analysis of sample GW-03-03 was reviewed. The reporting of silver in that sample in Table 5-25 is erroneous. The Gulf Coast Laboratories Corrective Action Report dated 10/15/86 shows that an asterisk should be included for this metal on Table 5-25 indicating that the original duplicate was not within control limits. Comparison of the silver result with the duplicate and unfiltered samples shows that silver should be reported as not detected. Silver has, therefore, not been detected in filtered groundwater at this site.

RESPONSE:

The detection of silver for MW-03 was qualified in the RI as "spike recovery not within control limits." The qualifier does not necessarily mean that silver was not detected. Furthermore, silver was detected in an unfiltered sample from MW-13.

COMMENT:

The ARC concurs with the conclusion in the RI that surface water, associated sediments, and biota are not an issue at this site.

RESPONSE:

The RI does not state that biota (fish) are not an issue at this site. The RI states that conclusions regarding adverse affects to human health from consumption of fish cannot be made due to problems with analytical detection limits.

COMMENT:

Information on soil gas measurement techniques was requested from IEPA/EPA under the Freedom of Information Act (FOIA) to

supplement the data presented in the RI, but did not arrive in sufficient time to permit a thorough review. Such a review should be conducted as part of final remedial design.

RESPONSE:

U.S. EPA received ARC's request for information on soil gas measurement techniques on May 16, 1988. ARC was notified that those documents could be picked up on May 26, 1988. The documents were picked up by ARC's messenger on May 31, 1988. The public comment period ended June 6, 1988.

B. Comments on Public Health and Environmental Assessment (PH&EA)

COMMENT:

ARC commented that the groundwater exposure scenario is unrealistic. Deed restrictions and other institutional controls as well as the nature and knowledge of the Boone County Conservation District regarding the site make such well placement so remote as to void any risk calculation based on this scenario.

RESPONSE:

The shallow aquifer located beneath the site would be classified as a Class II aquifer and, in fact, is used for drinking water in the area. Contaminants from the Belvidere Municipal Landfill site have been released to the shallow aquifer, making it unacceptable for drinking water use. U.S. EPA guidance states that an exposure assessment should present the 'worst probable case' exposure scenario. The PH&EA therefore illustrated the impact of site contaminants to the shallow aquifer with a scenario in which humans drink the contaminated groundwater. This scenario considered current site use and assumed only recreational visitor would consume groundwater for 6 months out of the year on weekends only. In addition, Region V policy states that an aquifer should not be considered "undrinkable" merely because there are no current or projected plans to use the aquifer for drinking water or because of contamination caused by the site. Therefore, such an ingestion scenario is an appropriate means to evaluate human health and environmental risks posed by the site.

Contrary to ARC's comment, deed restrictions are not in place at this time. It should also be recognized that deed restrictions may be very difficult to enforce and provide no protection to those persons consuming potentially contaminated groundwater downgradient from the site.

COMMENT:

Neither silver nor chloroform should be considered in the groundwater portion of the PH&EA.

RESPONSE:

They were not considered for the groundwater pathway.

COMMENT:

The actual dissolved concentrations, particularly of PCBs and PAHs, need to be determined for a more accurate assessment of public health risks from the consumption of contaminated groundwater.

RESPONSE:

As discussed previously, the Agencies believe that the actual dissolved concentrations of PCBs and PAHs have been adequately determined, and that the PH&EA provides a sufficiently accurate assessment of groundwater risk.

C. Comments on the Feasibility Study and Proposed Plan

1. Comments on Groundwater Extraction and Treatment

COMMENT:

ARC questions the need for groundwater remediation but later agrees that "mitigation" of groundwater is appropriate. ARC presents an arguement which suggests that groundwater needs only be cleaned to a level such that it will not cause the exceedance of ambient water quality criteria in the river.

RESPONSE:

The Agencies believe the ARC's logic is questionable in that it may rely upon dilution of the groundwater with river water to reach desired levels. It also ignores the inherent groundwater problem on-site and leaves open the possibility of contaminated groundwater passing under the river.

COMMENT:

The ARC further states that chromium does not require an action level since it was not detected above "the stated criterion of 1000 ug/l."

RESPONSE:

The value ARC referenced is an Illinois General Use Standard

for surface water, not groundwater. The MCL for chromium is 50 ug/l, a level which was exceeded in several groundwater samples.

COMMENT:

The ARC states that discharge of treated groundwater to the Belvidere POTW is desireable based on its technical feasibility and cost effectiveness. They also state that the Belvidere POTW Manager indicated (to ARC) that pretreatment would not be required.

RESPONSE:

The Agencies agree that discharge to the Belvidere POTW is both technically feasible and cost-effective. However, the Agencies questioned the administrative feasibility of this alternative (i.e., the willingness of the Belvidere POTW to accept extracted groundwater from the site). The Belvidere POTW Manager indicated to U.S. EPA that he didn't feel comfortable accepting the waste, but he would consider our request once we had more detailed data on the wastewater composition and volume. This data would be developed during design. If all local limits are met and it is acceptable to the Belvidere POTW, extracted groundwater from the Belvidere site can be directly discharged to the Belvidere POTW. However, as part of the RA, a sewer line from the landfill site connecting up existing lines will be required.

COMMENT:

The ARC has serious concerns about the practicality and achievability of the action levels proposed in Table 5-3 of the FS.

RESPONSE:

The title of Table 5-3 of the FS is misleading. It is not the Agencies' intention to apply ambient water quality criteria to the groundwater at this site. Groundwater action levels are to be risk based for the site. Primary MCLs shall not be exceeded. If there are no MCLs then indicator chemicals shall not exceed a cumulative excess cancer risk of 10E-06.

COMMENT:

The ARC states that the point of compliance should be at MW-06 and MW-07. Once the levels are satisfied, pumping can be suspended. Routine groundwater monitoring would be used to determine if action levels are exceeded. If levels are exceeded, the extraction system would be reactivated.

RESPONSE:

The point of compliance is the landfill boundary. The monitoring wells used to determine whether the groundwater has reached the cleanup levels at the point of compliance will be determined in the design phase. The Agencies agree that pumping can be suspended once cleanup levels are satisfied. The extraction system would be reactivated if groundwater monitoring indicates that the levels are exceeded.

COMMENT:

The ARC proposed a different set of wells to be used for groundwater monitoring at the Belvidere Landfill site.

RESPONSE:

The actual placement of monitoring wells will be determined during design. However, three additional monitoring wells will be placed on the west side of the Kishwaukee River to determine if contaminated groundwater is flowing beneath the river.

2. Comments on Cost

COMMENT:

The ARC commented that the cost estimates are generally appropriate for the purposes of the FS, but are not appropriate for purposes of funding. The ARC states that inflation was not considered in cost estimates, making alternatives with long-term operation and maintainence appear less expensive.

RESPONSE:

In accordance with U.S. EPA costing guidance, inflation is typically not included in the present worth cost. However, FS cost estimates are purposely made conservative (+ 50% - 30%) to ensure sufficient government funds are available for RA. It is possible that ARC can perform the RA for less than the FS estimates. Since FS cost estimates are based on the assumption that the federal government will conduct the RA, certain costs (bid contingencies) must also be included that may not be included if ARC was to perform the RA.

COMMENT:

The ARC suggests that the cost for venting gases generated by the landfill is not included in the FS cost estimates.

RESPONSE:

The cost of a passive venting system is included in the capping cost for each of the containment alternatives.

3. Comments on the RCRA Subtitle C Compliant Cap

COMMENT:

The ARC states that the meaning of a "RCRA-type" cap must be further defined. They in turn propose a cap which varies somewhat from the RCRA Subtitle C cap recommended in the Proposed Plan. In support of their recommendation they cite Illinois Environmental Protection Act Subtitle G Section 807.305, which states that only 2 feet or more of compacted material is needed to cover a landfill.

RESPONSE:

It should be pointed out that Section 807.305 deals with minimum requirements for the closure of sanitary landfills. Because hazardous constituents were disposed of in the landfill and are currently being released to the groundwater, it has been determined that RCRA Subtitle C closure requirements are both relevant and appropriate at this site. Therefore, the cap to be placed over the Belvidere Landfill must be compliant with RCRA Subtitle C capping requirements. These requirements are performance based. Capping contruction is not required to be exactly as presented in the FS. The exact characteristics of the cap will be determined during design.

COMMENT:

The ARC questioned the need for an active gas extraction system for the landfill cap.

RESPONSE:

The recommended alternative calls for a passive vapor extraction system, not an active system.

COMMENT:

The ARC suggests that the thickness of the frost protection layer be increased to 36 inches and consider that this will provide an additional level of flood protection.

RESPONSE:

The frost penetration zone in the Belvidere area is 36 inches.

Therefore, a 36 inch frost protection layer is a minimum thickness. Additional cap thickness would be necessary to ensure the cap's performance during a 100-year flood event.

4. General Comments

COMMENT:

The ARC commented that there were a number of shortcomings in the RI and FS documents. They conclude, however, that these problems do not materially effect the decision for the need for remediation on-site. However, ARC does suggest that most of the data generated during the RI/FS process should not be used for the final design of the adopted remedy.

RESPONSE:

The Agencies feel that this is not actually a shortcoming of the data. The primary purpose of the data generated during the RI is for use in developing a PH&EA and remedial alternatives; it is assumed that additional analyses will be necessary to aid in the design of the adopted remedy. These additional studies may include a pump test to better define the aquifer characteristics and treatability studies to determine compatibility of the waste stream with the treatment plant.

COMMENT:

The ARC states that the available documentation for the Belvidere Municipal Landfill site was reviewed over the period of June 2 to June 6, 1988.

RESPONSE:

The Agencies would like to point that all of the data for this site was made available for public review and comment from May 2 to June 6, 1988.

ADDENDUM TO THE RESPONSIVENESS SUMMARY

The public comment period for the Belvidere Municipal Landfill site started May 2, 1988 and ended June 6, 1988. The ARC was made aware of this comment period through the publication of the Proposed Plan and in an April 15, 1988 letter from U.S. EPA (Mr. Tim Conway) to the ARC (Mr. Jerry Homsy). However, on June 23, 1988, The ARC submitted an additional set of comments on the Belvidere Municipal Landfill Proposed Plan. These late comments serve to clarify previous comments made by the ARC on their choice of a cap for the landfill.

Although U.S. EPA is under no obligation to review these comments, a review was made by the Agency. In response, the Agencies stand by the decision expressed in the Record of Decision (page 32) and in the Responsiveness Summary (page 21) which states that the cap will be RCRA Subtitle C compliant. The specific design characteristics of this cap will be determined in the remedial design phase of this project.

APPENDIX B

BELVIDERE MUNICIPAL NO. 1 LANDFILL

ADMINISTRATIVE RECORD INDEX

as of June 27, 1988

Administrative Record Index
not included.

APPENDIX C

BELVIDERE MUNICIPAL NO. 1 LANDFILL

STATE OF ILLINOIS LETTER OF CONCURRENCE

Illinois Environmental Protection Agency 2200 Churchill Road, Springfield, IL 62706

217/782-6761

Refer to: L0070050001 -- Boone County
Belvidere Municipal No. 1 Landfill - Belvidere
Superfund - Enforcement

June 22, 1988

STATE OF ILLINOIS - RECORD OF DECISION

Site Name and Location

Belvidere Municipal No. 1 Landfill
Belvidere, Boone County, Illinois

Statement of Basis and Purpose

This decision document represents the State of Illinois' decision, through the Illinois Environmental Protection Agency, to select the remedial action as outlined in the Record of Decision and the Declaration for the Record of Decision issued in connection with the above-captioned matter. The selected remedial action for the above reference site was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Control Act (NCP). The attached Index identifies the documents which comprise the administrative record upon which the selection of the remedial alternative is based.

Description of the Remedy

This remedy addresses the source of the contamination by containing the on-site wastes and contaminated soils and extracting and treating the contaminated groundwater. The function of this remedy is to seal off the surface of the Belvidere Landfill to reduce the risk associated with contact and exposure to the contaminated material and reduce the amount of water infiltration through the surface which would otherwise contribute to groundwater contamination. In addition the selected remedy will reduce the risk associated with exposure to contaminated groundwater.

The major components of the selected remedy include:

- Capping the 19-acre landfill in accordance with the Resource Conservation and Recovery Act (RCRA) requirements;
- Installation of a plume barrier groundwater extraction and treatment system;
- Installation of a security fence around the perimeter of the site;
- Groundwater monitoring to ensure the effectiveness of the remedial action;
- Deed restrictions.

Illinois Environmental Protection Agency 2200 Churchill Road, Springfield, IL 62706

Declaration

The selected remedy is protective of human health and the environment, attains federal and State requirements that are applicable or relevant and appropriate (ARARs), and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site. However, because treatment of the principal threats at the site was found not to be practicable, this remedy does not satisfy the statutory preference for treatment as a principal element of the remedy. The size of the landfill and the fact that there are no on-site hot spots that represent the major sources of contamination preclude a remedy in which contaminants effectively could be excavated and treated.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years (as mandated by CERCLA and SARA) after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

In the event that the negotiations conducted by the USEPA and IEPA with the potentially responsible parties fail to achieve the desired result, a fund-financed remedial action may be unavoidable. In this event, the cost-effectiveness of the selected remedy enables the State to favorably consider a 50% match fund financed remediation. The State's final position on this subject will be formulated at the close of the PRP negotiations period.

6/23/88
Date

Bernard P. Killian
Acting Director
Illinois Environmental Protection Agency

JL/jab/1824j/42-43

Attachment: Administrative Record Index

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

INDEX OF THE ADMINISTRATIVE RECORD

- Preliminary Assessment Report (PA)
- Site Investigation Report (SI)
- Removal Documents (on-scene coordination report)
- QA/QC Date from Laboratory (at IEPA, LPC files)
- Date Summary Sheets (Refer to Remedial Investigation)
- Chain of Custody forms (at IEPA, LCP files)
- Quality Assurance Project Plan (QAPP)
- Supplemental QAPP - Private Wells
- Supplemental QAPP - Fish Flesh
- Initial Work Plan - (Initial Scope of Work)
- Amendments to SOW
- Remedial Investigation (RI)
- Feasibility Study (FS)
- ARARs Array
- Community Relations Plan
- Public Health and Environmental Assessment
- ATSDR Health Assessment
- PRP Notices and Information
- Public Comment (RI/FS) - Illinois Department of Public Health
- Response to Public Comment - Responsiveness Summary
- Transcript of Public Meeting
- Record of Decision (ROD)
- Amendments to ROD (if applicable)
- Administrative Order
- Consent Decree
- Affidavits

JL:pss